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^a Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

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ABSTRACT NUMBER.

No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A handbook of colloid chemistry; the recognition of colloids, the theory of colloids, and their general physico-chemical properties, W. OSTWALD, trans. by M. H. FISCHER, R. E. OESPER, and L. BERMAN (*Philadelphia: P. Blakiston's Son & Co., 1915, pp. XII+278, pl. 1, figs. 60*).—This is the first English edition, translated from the third German edition of this work. It contains methods for general and special colloid analysis and a general theoretical consideration of the subject of colloid chemistry. Many references to original communications are cited in the text.

Industrial and manufacturing chemistry.—I, Organic, G. MARTIN ET AL. (*London: Crosby Lockwood & Son, 1915, 2. ed., rev. and enl., vol. 1, pp. XX+734, pls. 5, figs. 244*).—This is the second edition, revised and enlarged, of the work previously noted (E. S. R., 30, p. 610). The various sections have been brought up to date and new ones added on the hydrogenation of fats, the manufacture of milk sugar, the manufacture of maize and arrowroot starch, the analysis of rubber, and the new synthetic tanning materials. An index list of trade names of the newer synthetic drugs, photographic developers, etc., is appended.

Supplement to Muspratt's encyclopedia of technical chemistry.—Technology of the organic chemical industries, edited by A. BINZ (*Ergänzungswerk zu Muspratt's Encyclopädischem Handbuch der Technischen Chemie.—Chemische Technologie Organischer Industriezweige. Brunswick: F. Vieweg & Son, 1915, vol. 3, 1. half, pp. XIV+515, figs. 51*).—This is the first part of the third supplementary volume to the original work. The general subjects considered are ether, drugs and sera, celluloid, cellulose, the use of cellulose esters for films, disinfection, protein, protein preparations, noninflammable solvents and extraction agents, natural dyestuffs, intermediate products of the coal-tar dye industry, coal-tar dyes, pigments, the determination, testing, and value of coal-tar dyes, and varnishes, siccatives, and lac.

Supplement to Muspratt's encyclopedia of technical chemistry.—The chemical technology of fermentation and food stuffs, edited by F. HAXDIK (*Ergänzungswerk zu Muspratt's Encyclopädischem Handbuch der Technischen Chemie.—Chemische Technologie der Gärungstechnik, Nahrungs- und Genussmittel. Brunswick: F. Vieweg & Son, 1915, vol. 4, 1. half, pp. XI+516, figs. 331*).—This is the first part of the fourth supplementary volume to the original work. The subjects considered are alcohol and compressed yeast, beer, bread, butyric acid, vinegar, and the tanning industry.

Chemical changes in the souring of milk, L. L. VAN SLYKE and A. W. BOSWORTH (*New York State Sta. Tech. Bul.*, 48 (1916), pp. 121; *Jour. Biol. Chem.*, 24 (1916), No. 3, pp. 191-202).—The results of the investigation reported demonstrate that about 22 per cent of the lactose of milk is changed by the lactic acid bacteria during the process of souring. Of this amount about 88.5 per cent is converted into lactic acid. The citric acid present in the milk completely disappears, being decomposed into acetic acid and carbon dioxide by *Bacterium lactis aerogenes*. The insoluble inorganic constituents of normal milk are made soluble by the acid resulting from bacterial action. The albumin which in normal milk only partly passes through a porous porcelain filter is so changed in some manner during the souring as to pass completely through such a filter. The calcium caseinate of normal milk is completely converted into free protein and precipitated as such, the calcium forming calcium lactate which is soluble in the serum.

The rate and extent of chemical change under given conditions was also studied. The greatest change of conversion of milk sugar into lactic acid was found to occur between the tenth and the twenty-fourth hour after inoculation. The acidity increased rapidly during the first 24 hours, the rate of increase diminishing after this time. The amount of albumin nitrogen in milk serum was found to increase with the increase of acidity. All of the albumin of the milk appeared in the serum in 14 hours.

The experimental methods used in the investigation were those described in the bulletin previously noted (E. S. R., 32, p. 607).

Chemical changes occurring during the ripening of the wild goose plum, J. S. McHARGUE (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 718-722).—From the results of a study at the Kentucky Experiment Station the author concludes that there is a gradual diminution in the acidity of the fruit during the ripening period, and at the same time an increase in the amount of reducing sugars formed. The greatest increase in total sugars occurs in passing from the unripe to the ripe condition. Saccharose plays a very important part in the ripening of this fruit, which suggests the idea that a fruit is just ripe when it contains the maximum amount of saccharose. This plum contains the enzyme invertase, which is apparently most active in the passage of the fruit from the ripe to the overripe stage.

The essential oil of sugi (*Cryptomeria japonica*) leaves, S. UCHIDA (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 687-699).—The sugi is a coniferous tree indigenous to Japan, and extensively cultivated as a valuable timber. The essential oil of the leaves, obtained by steam distillation, was found to contain the following substances: d_{4}° = α -pinene; dipentene; an alcohol ($C_{10}H_{18}O$, b. p.=212-214°, d_{4}° =0.9414, $n_D^{25.5}$ =1.4832); cadinene; a sesquiterpene with two double linkings ($C_{16}H_{26}$, b. p.=266-268°, d_{4}° =0.9335, $n_D^{25.5}$ =1.5041, $[a]_D^{25}=+15.19^{\circ}$ in a 6.08 per cent chloroform solution); a sesquiterpene alcohol ($C_{16}H_{26}O$, b. p.=284-286°, d_{4}° =0.9023, $n_D^{25.5}$ =1.5048, $[a]_D^{25}=+16.76^{\circ}$ in a 5 per cent chloroform solution); new diterpene ($C_{20}H_{32}$, b. p.₇₀=345°, b. p.₉₀=198, $[a]_D^{25}=-34.22^{\circ}$ in a 4.67 per cent chloroform solution) for which the author proposes the name " α -cryptomerene"; a lactone ($C_{10}H_{18}O_2$); caprylic acid in combination with the alcohol; higher fatty acids in a free state; and a blue oil "azulene."

The relative proportion of the above constituents present was also determined.

Essential oil of Formosan hinoki (*Chamæcypris obtusa*) wood, S. UCHIDA (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 699-702).—The hinoki tree is extensively grown in Japan and furnishes a timber wood of superior quality. The crude oil obtained by dry distillation of the wood was rectified by steam

distillation and found to consist chiefly of *d*- α -pinene and cadinene, with a small amount of oxygenated compounds. The amount of terpenes was about 70 per cent and of sesquiterpenes about 24 per cent.

The thermal values of the fats and oils.—I. The heat of bromination, J. W. MARSH (Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 121-126, figs. 3).—A special apparatus and method for the determination of the true heat of bromination, and also a new apparatus for the rapid determination of specific heat, are described. Experimental data indicate that the heat of bromination is not directly comparable to the iodin number. The heats of solution of bromin and most oils in carbon tetrachloride were found to be very small.

The action of bromin on proteins and amino acids, M. SIEGFRIED and H. REPPIN (Happo-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 1, pp. 18-28).—Experimental data on the absorption of bromin by proteins and amino acids are submitted.

It is indicated that in a mixture of protein cleavage products only amino acids containing a ring complex absorb bromin. Gelatin and edestin absorb more bromin than their cleavage products. The significance of the results obtained is discussed.

On the chemical constitution of the proteins of wheat flour and its relation to baking strength, M. J. BUSH (Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 138-144).—As the result of his investigation the author concludes that the individual proteins of both strong and weak flours are identical in their chemical constitution as determined by the Van Slyke method (E. S. R., 26, p. 22). The gliadin-glutenin ratio is more constant in flours of different baking qualities than has been indicated by previous investigators, the great variation being in the "soluble proteins." The determination of ammonia nitrogen in the hydrolyzed products of flour, extracts of flour made with various solvents, and crude gluten is proposed to serve as an accurate indication of the amounts of the various proteins present in the flour.

The refractive indices of solutions of certain proteins.—IX. Edestin, C. L. A. SCHMIDT (Jour. Biol. Chem., 23 (1915), No. 2, pp. 487-493).—Experimental data of the refractive indices of varying amounts of edestin, dissolved in various concentrations of solutions of acids, bases, and salts, are submitted.

The solutions were found to follow the law $n-n_i=a\times e$ (E. S. R., 25, p. 709), the average value for a being 0.00174 ± 0.00006 . The value for a remained constant, even though the solvent caused hydrolysis of the dissolved protein.

The preparation of glucosamin hydrochlorid from mucoid obtained from the ascitic fluid, A. OSWALD (Happo-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 2-3, pp. 100, 101).—On boiling the mucoid obtained from the ascitic fluid with 3 per cent hydrochloric acid, filtering, and concentrating the filtrate, the characteristic crystals of glucosamin hydrochlorid were obtained and easily identified.

Enzyme investigations.—X. Experiments on the enzymatic synthesis of disaccharids, W. LÖB (Biochem. Ztschr., 72 (1916), No. 5-6, pp. 392-415).—From the investigation reported the author concludes that the invertase of sugar beets, as well as that of yeast and pancreas, is unable, under the experimental conditions described, to synthesize cane sugar from its corresponding hexoses.

The influence of certain substances on the activity of invertase, E. G. GIFFIN and J. M. NELSON (Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 722-730).—Experimental data submitted indicate that the inhibiting effect on enzyme activity of certain substances, such as glass beads, serum, and egg albumin, is due to a lowering of the hydrogen ion concentration. The effect of

charcoal was also found to be due to a change in the hydrogen ion concentration. Relatively large amounts of this material, however, were found to absorb invertase from solution. Gelatinous aluminum hydroxid was also found to possess this adsorbing power, but in small amounts it did not interfere with the activity of the enzyme.

The occurrence of arginase in the animal organism and its determination by the formal titration procedure, S. EDLRACHER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 81-87).—From his investigation the author concludes that the Sörensen formal titration method is a convenient and reliable procedure for the determination of arginase. Arginase was found in the liver of guinea pigs and rabbits, but was absent from this organ in birds and reptiles. Its presence in the kidneys, thymus, and intestinal mucosa of birds, as reported by Kossel and Dakin,^a could not be determined by the method followed.

A hydrogen electrode vessel, W. M. CLARK (*Jour. Biol. Chem.*, 23 (1915), No. 2, pp. 475-486, fig. 1).—The author describes a form of apparatus devised to meet some special requirements in a study of the hydrogen ion concentrations of bacterial cultures. The accuracy of the results obtained with the apparatus is indicated by experimental data.

Simple sodium lamp for polariscope, G. K. FORESMAN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, p. 165).—The device consists of a piece of fire and acid proof asbestos with a slit of the proper size cut in, and is used in connection with an ordinary Bunsen burner with a wing top. By saturating the edges of the slit with salt solution a flame of great intensity is produced. The asbestos does not affect the quality of the sodium flame.

A large fat extractor, C. L. A. SCHMIDT (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, p. 165, fig. 1).—A large apparatus in which several pounds of material may be extracted in a single operation is described and illustrated by a figure. It consists essentially of two parts, a large distilling flask and the extractor proper, which is made of heavy glass. To insure ether-tight seals mercury is used at all the connections. The apparatus may be used for the recovery of the solvent used in the extraction.

Soda lime as an energetic general reagent and its great chemical activity, I. GUARESCHI (*Abs. in Chem. Abs.*, 10 (1916), No. 1, p. 25).—A review of the literature of soda lime is given and its history and uses discussed in detail.

Experimental data indicate that soda lime is an excellent absorbent for chlorin, bromin, hydrochloric acid, hydrobromic acid, nitrogen peroxid, and carbonyl chlorid. The freshly prepared reagent absorbs from 80 to 90 cc. of carbon dioxid in 10 minutes. When prepared from calcium oxid and a solution of sodium hydroxid it was found to be a better absorbent for carbon dioxid than solid potassium hydroxid. Carbon monoxid, pyrrol, indol, aldehydes, ethyl bromoacetate, benzyl bromid, chloroacetone, and a number of ethers and nitriles were found to be more or less completely absorbed.

The author concludes that soda lime probably is not a simple mixture but a definite compound, and proposes formulas. With traces of iron, manganese, etc., it is considered superior to the chemically pure material as an absorbent since these substances act as catalysts.

A rapid method of converting scrap platinum into chloroplatinic acid, J. B. and A. TINGLE (*Jour. Soc. Chem. Indus.*, 35 (1916), No. 2, p. 77).—A method in which the platinum is alloyed with zinc by fusion under a layer of borax or other flux is described. The metallic mass which results from the fusion is treated with dilute commercial hydrochloric acid. The zinc dissolves rapidly

^a *Hoppe-Seyler's Ztschr. Physiol. Chem.*, 42 (1904), No. 3, p. 184.

and leaves behind a black powder resembling platinum black. This is dissolved in aqua regia, the resulting solution evaporated to dryness, and the residue redissolved in very dilute hydrochloric acid. From this solution the platinum is separated either by precipitating the metal with zinc or by precipitating with hydrogen sulphid, filtering, washing, and igniting the resulting sulphid. The platinum thus obtained is readily soluble in aqua regia, and easily converted into chloroplatinic acid in the usual manner.

A possible source of error in colorimeter observations, J. H. Long (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 716-718).—The author reports certain discrepancies in colorimeter observations which resulted from using an instrument which had stood through a hot summer in a room the temperature of which often reached 33° C. (91.4° F.). At this temperature the wax by which the prisms are fastened in their brass sockets becomes soft enough to permit the slow displacement of the glass. Care should therefore be exercised to keep instruments away from the vicinity of steam radiators and from places which are likely to become very warm in summer.

An evaluation of the methods for the determination of phosphoric acids soluble in citric acid and that found in dephosphorization slags (Thomas slag), O. SICHMANN (*Zhur. Opytn. Agron.*, 16 (1915), No. 3, pp. 169-212).—As the result of a critical comparison the author has found very little difference between the molybdate method, the methods of Lorenz (E. S. R., 13, p. 14), Popp (E. S. R., 29, p. 410), Darmstadt, and Naumann (E. S. R., 14, p. 910), and the hydrochloric acid method. The Lorenz method gave the lowest results. For convenience and rapidity the methods of Popp and Lorenz are recommended, the latter being the simpler.

Easily extractable phosphorus and phosphorus nutrition, I. JAKOUCHKINE (*Zhur. Opytn. Agron.*, 16 (1915), No. 2, pp. 118-139).—The author has shown that for material poor in fat, such as stems or stalks, the alcohol and ether extraction does not cause an appreciable decrease of phosphorus pentoxide in the acid extract. Direct precipitation in citric acid was used in separating the mineral phosphate from the phytin. More exact results may be obtained by using this method in combination with that of Ivanoff by first precipitating with magnesia mixture in the presence of citric acid, and, after dissolving in nitric acid, reprecipitating by Neumann's method.

The amount of phytin in the grain is apparently dependent on the condition of the soil. The fertility of the soil is indicated by the mineral-phosphate content of the straw, and when the content is less than from 0.07 to 0.1 per cent a phosphate fertilizer is deemed necessary, while a mineral-phosphate content greater than 0.15 per cent shows that the soil is sufficiently rich in phosphorus.

The decomposition of tetrathionates in alkaline solution as a source of error in certain iodin titrations, R. M. CHAPIN (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp. 625, 626).—The experimental data reported indicate that "tetrathionates are notably sensitive to even low concentrations of hydroxyl ions, though only slightly affected by sodium bicarbonate, and still less by sodium bicarbonate in presence of carbonic acid. It therefore follows that acid solutions containing tetrathionates, if to be later titrated with iodin or subjected to any treatment involving assumption that the tetrathionate present has remained unaffected, should never be neutralized by any substance of distinctly alkaline properties." Sodium carbonate, however, may be used within reasonable limits of error, provided the solution is not subjected to an elevated temperature for any length of time. Sodium sulphite is recommended as a discharging agent for iodin in place of sodium thiosulphate.

Report of the session of the International Commission for Chemical Soil Analysis; Munich, April 23 and 24, 1914 (*Internat. Mitt. Bodenk.*, 5 (1915), Nos. 1, pp. 25-52; 2, pp. 127-153).—This is an account of the proceedings of the commission, including discussions of chemical methods for soil analysis.

The application of potassium permanganate for the determination of humus in soils, P. GRIGOREFF (*Zhur. Opytn. Agron.*, 16 (1915), No. 3, pp. 217-222).—The probable nature of the oxidation of the humus in soil by potassium permanganate is considered. The results obtained by the oxidation method do not agree with those obtained by Gustavsohn's method, the former method yielding too high results. For this reason it is concluded that the oxidation method, although simple and rapid, is not to be preferred to the combustion method.

On the distribution and composition of the humus of the loess soils of the transition region, M. J. BLISH (*Univ. [Nebr.] Studies*, 14 (1914), No. 2, pp. 111-144).—From a long series of experiments on Nebraska soils the author concludes that the Rother method (E. S. R., 26, p. 406) for humus determinations is the most practical of all gravimetric methods tried. For the determination of humus nitrogen the Alway-Bishop procedure was found to be the most satisfactory, both in point of accuracy and economy of time.

Soil color may be associated fairly closely with humus content when the soils under inspection are from the same locality. A reliable comparison, however, can not be made with soils from different localities on account of the presence of substances other than humus, such as lime and iron. The photometric determination was not found to give satisfactory results with soils containing less than 0.1 per cent of humus. Great variation in the humus content of the soils was found with respect to both locality and depth from which the samples were taken.

A comparison of methods for the determination of soil phosphorus, W. O. ROBINSON (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 148-151).—The results of the author's investigation indicate that accurate determinations can be obtained by the fusion, Washington, and Fischer methods of treating the soil for phosphorus determinations. Vanadium interferes with the volumetric phosphorus determinations in soils, but the difficulty was overcome by reducing the vanadium with ferrous sulphate and precipitating the phosphorus at a low temperature by agitation. Tungsten and titanium were not found to interfere with the phosphorus determinations by the gravimetric method when proper precautions for complete precipitation were exercised.

A limestone tester, C. G. HOPKINS (*Illinois Sta. Circ.* 185 (1916), pp. 2-12, figs. 2).—This circular describes in detail a simple apparatus and method for the determination of calcium carbonate in limestones used for agricultural purposes, similar to and based on the same principle as the "calcimeter" previously noted (E. S. R., 34, p. 503).

The final result can not be ascertained by direct reading but involves a simple calculation. Tables of the weight of carbon dioxide in milligrams per cubic centimeter at various temperatures and pressures are included.

The apparatus may also be used for determining the limestone content of soils.

Some new methods for the analysis of lime-sulphur solutions, R. M. CHAPIN (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 151-156).—New methods based on definite reactions are described in detail. Some of the procedures are applicable to polluted dipping baths through which sheep and cattle have passed.

On the detection and determination of halogens in organic compounds, I. DROGIN and M. A. ROSANOFF (*Jour. Amer. Chem. Soc.*, 38 (1916), No. 3, pp.

711-716).—An improvement of the method described by Stepanoff^a and modified by others is outlined in detail.

The method consists in dissolving the halogen compound in 98 per cent alcohol, adding an excess of sodium and, after sufficient heating, diluting the mixture with water. The alcohol is then distilled off, the solution acidified with nitric acid, and the free halogen acid, thus produced, titrated according to Volhard's method. Experimental data submitted indicate the accuracy of the method. The qualitative procedure was found to yield a decided positive test in certain cases where the Beilstein test gave a doubtful result.

A method for the estimation of chlorids in cheese, ELFREIDA C. V. CORNISH and J. GOLDING (*Analyst*, 40 (1915), No. 470, pp. 197-203, *fig. 1; abs. in Ztschr. Angew. Chem.*, 29 (1916), No. 2, *Referatteil*, p. 4).—A method claimed to be more accurate and rapid than the incineration or water-extraction method is described.

The sample is treated in a Kjeldahl flask with concentrated sulphuric acid and gently heated. By means of a specially arranged apparatus the hydrochloric acid formed by the action of the sulphuric acid on the chlorids present is aspirated into standard acid silver nitrate and precipitated as silver chlorid. When the reaction is complete the silver chlorid is filtered, washed free of nitrates, the washings added to the filtrate, and the excess of silver nitrate in the filtrate determined according to Volhard's method. Experimental data, obtained from different samples of normal cheese and others showing a brown discolouration are submitted.

The cheese residue remaining in the flask after the distillation of the hydrochloric acid may be used for the estimation of nitrogen in the solid cheese, by Kjeldahl's method.

The determination of acidity in potatoes, J. F. HOFFMANN and F. PRECKEL (*Landw. Vers. Stat.*, 87 (1915), No. 2-3, pp. 237-239).—The following procedure is recommended by the authors:

Fifty cc. of the pressed juice is measured into a 250 cc. flask, and 95 per cent alcohol added to the mark. The mixture is allowed to set for about one hour with occasional shaking and then filtered. For the titration 100 cc. of the filtrate is diluted with an equal volume of water and 1 cc. of rosolic acid added. The liquid thus contains about 80 cc. of alcohol and 120 cc. of water. A comparison solution is prepared in a similar manner with 80 cc. of alcohol and 120 cc. of water and titrated to a definite color change. The potato sample is titrated to the same shade and the reading of the comparison solution subtracted from that of the potato sample. The liquids should be well shaken before titrating in order to remove as much as possible of the carbon dioxid, which influences the color change.

The analysis of maple products.—V, Miscellaneous observations on maple syrup incidental to a search for new methods of detecting adulteration, J. F. SNELL (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 144-148).—Certain observations made while working on new methods for the detection of adulteration are recorded. A complete ash analysis of a composite of about 60 genuine syrups indicated the presence of more chlorin and less phosphoric acid than the analyses previously recorded.

^b See also previous notes (E. S. R., 32, p. 808; 33, pp. 15, 208).

The determination of small amounts of sugar in urine, S. NAGASAKI (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 61-77).—For determining small amounts of sugar in urine the author has devised a method as follows:

^a Ber. Deut. Chem. Gesell., 39 (1906), No. 16, pp. 4056, 4057.
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The sample is first titrated with Benedict's copper solution (E. S. R., 25, p. 15). Another sample is then inoculated with the yeast *Torula monosa* and allowed to ferment for 24 hours at 30° C. After the fermentation the sample is again titrated with Benedict's solution and the amount of glucose calculated from the difference in the two titrations. By boiling the fermented urine with citric acid and repeating the fermentation and titrations as before, the isomaltose, calculated as glucose, can be easily determined. Samples in which spontaneous fermentation has started do not give reliable results.

The method is deemed of value in determining the slight influence of a diet in cases of glycosuria, and in making a diagnosis of doubtful cases of diabetes. The average glucose content of 174 samples of normal urine was found to be 0.012 per cent (maximum 0.033, minimum 0.002 per cent), and the average percentage of isomaltose in 84 samples was found to be 0.012 per cent (maximum 0.023, minimum 0.003 per cent).

The determination of amino acids in urine, I. BANG (*Biochem. Ztschr.*, 72 (1915), No. 1-2, pp. 101-103).—To obviate the inconvenience of titrating a colored solution in the formol titration method for the determination of amino-acid nitrogen the author recommends that the solution be decolorized with blood charcoal in the presence of 20 per cent alcohol. No amino-acid nitrogen is lost by this procedure.

New indican reaction, A. JOLLES (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 1, pp. 29-33).—The following procedure is recommended as a qualitative test for indican:

Ten cc. of urine is mixed with 1 cc. of a 5 per cent alcoholic solution of α -naphthol and 10 cc. concentrated hydrochloric acid (containing 5 gm. ferric chloride per liter). The mixture is thoroughly shaken and allowed to set for 15 minutes, after which the coloring matter is extracted with 5 cc. of chloroform. The color of the extract will vary from violet to a dark blue, depending on the amount of indican present. The reaction is sensitive to 0.003 mg. indican in 10 cc. of liquid, but is not applicable to quantitative colorimetric determinations.

The nephelometric determination of small amounts of essential oils, A. G. WOODMAN, R. T. GOOKIN, and L. J. HEATH (*Jour. Indus. and Engin. Chem.*, 8 (1916), No. 2, pp. 128-131, figs. 2).—A procedure based on the formation of an emulsion on adding water to an alcoholic solution of an essential oil, using the Kober nephelometer previously noted (E. S. R., 31, p. 114), is described. Great accuracy is said to be possible with the method in concentrations up to 1 per cent and, by suitable dilution with alcohol, in higher concentrations. In applying the method to cordials the percentage of alcohol and sugar influences the results to such an extent that it is necessary to use a standard containing approximately the same amounts of these materials. If the cordials are deeply colored the alcohol may be distilled off and the distillate compared with a standard extract.

The utilization of cherry by-products, F. RARAK (*U. S. Dept. Agr. Bul.* 35 (1916), pp. 24).—As a result of the investigation the author obtained from the pits of red sour cherries a fixed oil, the physical and chemical properties of which were found to be very similar to those of the commercial oil of almonds. It is indicated that this oil should find application along pharmaceutical and therapeutical lines, as a condimental oil, or in the soap-making industry. The volatile oil produced from the press cake is practically identical with the oil of bitter almonds, and would thus find the same application. Analysis of the meal, which is the final residue, showed 1.06 per cent of moisture, 30.87 per cent of protein, 13.1 per cent of ether extract, 42.13 per cent of nitrogen-free

extract, 8.9 per cent of crude fiber, and 3.94 per cent of ash. From the juice alcohol, sirup, and jelly have been successfully prepared.

SOILS—FERTILIZERS.

Soil survey of Lee County, Iowa, L. V. DAVIS and M. E. SAR (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 36, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station and issued March 10, 1916, deals with the soils of an area of 327,040 acres in southeastern Iowa.

“The county comprises two main physiographic divisions. The upland plateau, with level to rolling topography, constitutes one division, and the alluvial river terraces and first bottoms the other. The former occupies about six-sevenths of the total area of the county.” The soils of the county are of loessial, glacial, residual, and alluvial origin. Nineteen^{*} soil types of nine series are mapped, of which the Grundy silt loam, the Lindley loam, the Putnam silt loam, and the Memphis silt loam cover respectively 27.5, 23.7, 11.4, and 10 per cent of the area.

Soil survey of Cherokee County, Kansas, P. O. WOOD and R. I. THEBOCK-MORTON (*Kansas Sta. Bul. 207 (1915), pp. 46, pl. 1*).—This survey, made in cooperation with the Bureau of Soils of this Department and noted in the Field Operations of that Bureau for 1912 (E. S. R., 34, p. 322), deals with the general characteristics, mechanical and chemical composition, and crop adaptabilities of the soils of an area of 374,400 acres in southeastern Kansas, consisting mainly of residual prairie.

The soils are residual upland soils and alluvial bottom soils. Including meadow, 22 soil types of 13 series are mapped, of which the Bates silt loam and the Cherokee silt loam cover 24.5 and 20 per cent of the area, respectively. Chemical analyses of samples of the types are reported, the results of which are taken to indicate that these soils are relatively deficient in nitrogen, phosphorus, potassium, and lime, and high in organic matter. The majority of the soils are acid.

A fertilizer test with wheat is included.

Soil survey of Reno County, Kansas, W. T. CARTER, JR., ET AL. (*Kansas Sta. Bul. 208 (1915), pp. 48, pl. 1*).—This survey, made in cooperation with the Bureau of Soils of this Department and noted in the Field Operations of that Bureau for 1911 (E. S. R., 31, p. 513), deals with the general characteristics, mechanical and chemical properties, and crop adaptabilities of the soils of an area of 812,000 acres in south-central Kansas, the general topography of which is that of a rolling plain intersected by three relatively narrow valleys.

The soils of the area are upland and bottom soils and are formed (1) from shales and sandstones, (2) from unconsolidated water-laid deposits, (3) from mixture of the above two groups, and (4) from wind-laid deposits. Including meadow and dune sand, 31 soil types of 10 series are recognized, of which the Pratt loam and fine sandy loam and the Albion sandy loam cover 16.6, 15.1, and 11.1 per cent of the area, respectively. Chemical analyses of representative samples of each type made at the station are reported, the results of which show that the nitrogen content averages 0.106 per cent for the surface soil, 0.076 per cent for the subsurface soil, and 0.045 per cent for the subsoil, and the phosphorus content averages 0.034 per cent for the surface and subsurface soil and 0.031 per cent for the subsoil. The potash and lime contents are considered to be relatively high, most of the soils containing more than 2 per cent potassium. The average calcium content for the county was 4.88 per cent in the soil, 1.47 in the subsurface soil, and 1.73 in the subsoil.

Soil survey of Union County, North Carolina, B. B. DERRICK and S. O. PERKINS (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and issued March 4, 1916, deals with the soils of an area of 403,200 acres in southern North Carolina.

"The general surface features of Union County consist of broad, gently rolling interstream areas, which become more rolling, broken, and hilly as the larger streams are approached. The central, eastern, and northern portions of the county slope to the northeast and are well drained by the Rocky River and its tributaries, while the remainder inclines toward the southwest, being drained by tributaries of the Catawba River." The county lies wholly within the Piedmont Plateau province and the soils are of residual origin. Sixteen soil types of 8 series are mapped, of which the Alamance silt loam and gravelly silt loam cover 24.7 and 16.9 per cent of the area, respectively, and the Georgeville gravelly silt loam and silt loam 15.5 and 13.9 per cent, respectively.

Soil survey of Portage County, Ohio, C. N. MOONEY, H. G. LEWIS, A. F. HEAD, and C. W. SHIFFLER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 44, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Agricultural Experiment Station and issued March 4, 1916, deals with the soils of an area of 333,440 acres in northeastern Ohio, the topography of which ranges from flat or slightly undulating to rolling and hilly. The soils are of glacial and alluvial origin. Including muck, 18 soil types of 10 series are mapped, of which the Volusia clay loam, loam, and silty clay loam cover 27.4, 25.1, and 10.1 per cent of the area, respectively, and the Wooster loam 18.1 per cent.

Analyses of typical soils, J. W. AMES (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 73-76*).—Results selected from a number of analyses of representative soils from various localities in Ohio are reported in the following table for the purpose of indicating the variations in amounts of fertility constituents that may exist in different classes of soil:

Fertility constituents in different classes of soil, per acre.

Type of soil.	Depth.	Nitrogen.	Phosphorus.	Potash.	Calcium.	Magnes.
	Inches.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
Sand.....	0-7	8.00	8.00	20,000	9,038	4.40
Sandy loam.....	0-7	2,393	783	28,772	12,302	5.18
Do.....	7-15	590	282	30,636	11,412	5.35
Silt loam.....	0-7	2,096	870	29,992	4,758	5.84
Do.....	7-15	1,054	608	31,278	3,996	7.50
Clay loam.....	0-7	2,928	766	31,331	7,560	6.27
Do.....	7-15	1,152	388	35,068	7,022	9.40
Clay.....	0-7	2,170	690	42,381	5,618	15.00
Do.....	7-15	910	428	44,500	3,726	13.90
Black clay loam.....	0-7	4,900	1,456	41,506	15,844	11.18
Do.....	7-15	2,100	788	49,572	14,180	17.80
Black clay.....	0-7	7,440	1,588	46,726	18,300	11.38
Do.....	7-15	3,900	1,446	52,900	16,630	15.77
Peat.....		27,860	1,710	3,370	2,010	2.49

Geo-agronomic study of the farm lands of the Royal Institute of Experimental Agriculture in Perugia, B. MARCARELLI (*Staz. Sper. Agr. Ital. 4 (1915), No. 4, pp. 233-271, pl. 4*).—This is a detailed description of the topography, geology, origin, and characteristics of the soils and of the meteorological and agricultural conditions of the farm lands of the institute and includes mechanical and chemical analyses of the soils.

Soils study according to the geological-agronomic survey, with especial reference to the soils types of the lower Rhine districts, E. ZIMMERMANN (*Fühlung's Landw. Ztg.*, 64 (1915), No. 13-14, pp. 329-347).—This is a general discussion of the methods, results, and advantages of this kind of soil survey as applied to the lower Rhine districts.

Successful soil-sampling tools, A. M. SHAW (*Engin. News*, 74 (1915), No. 26, p. 1228, fig. 1).—A soil-sampling outfit consisting of an auger and pipe extension for taking deep samples is described.

Recent brown soil and humus formation in Java and the Malay Peninsula, together with remarks on climatic weathering, R. LANG (*Centbl. Min., Geol. u. Paläontol.*, 1914, Nos. 17, pp. 513-518; 18, pp. 545-551; *abs. in Zenbl. Agr. Chem.*, 44 (1915), No. 4-5, pp. 148-150).—The author reports the results of observations on the occurrence and origin of the so-called brown soils and humus soil of Java and the Malay Peninsula and the influence of climatic factors on their formation.

It is concluded that the main factor in the formation of both these soils is an extraordinarily heavy rainfall. Brown soils are formed when the waters of a tropical region are so impregnated with mineral salts as to effect an adsorptive saturation of the soil humus substances with which they come in contact.

Raw humus is formed where the waters of tropical regions do not contain sufficient mineral salts to effect an adsorptive saturation of humus substances. It is further concluded that dampness and coolness favor humus formation, while heat and dryness retard it.

Determination of amino acids and nitrates in soils, R. S. POTTER and R. S. SNYDER (*Iowa Sta. Research Bul.* 24 (1915), pp. 327-352, figs. 3).—This bulletin briefly reviews the work of others bearing on the subject and reports the details of the experiments noted below and of experiments previously noted from another source (E. S. R., 34, p. 112).

The amino acid nitrogen of soil, R. S. POTTER and R. S. SNYDER (*Jour. Indus. and Engin. Chem.*, 7 (1915), No. 12, pp. 1049-1053, figs. 3).—Laboratory and pot experiments are reported in which it was found that by use of the Kober copper method of determining amino acids (E. S. R., 31, p. 211) no amino acid nitrogen could be detected in the dilute acid extract of soils. Upon adding small quantities of amino acid to a soil and extracting with dilute acids no amino acid was found. "Upon adding small quantities of amino acids to a soil and extracting with dilute alkali, practically the entire amount added was recovered. There was found to be no difference in the quantity of amino acid nitrogen extracted by dilute alkali in one, two, four, and six hours."

From the pot experiments it is concluded that "there is no tendency for amino acid to accumulate . . . in a limed and unlimed acid soil, in a heavily manured and limed, and a heavily manured unlimed acid soil. The amino acid nitrogen was present in the soil in less amounts than the ammonia nitrogen, but in a general way it fluctuates with the ammonia nitrogen. The soils with the higher amounts of manure show a decided decrease in the amount of nitrate nitrogen at first, but after from four to six weeks there is a decided increase."

The origin of the "niter spots" in certain western soils, W. G. SACKETT and R. M. ISHAM (*Science, n. ser.*, 42 (1915), No. 1083, pp. 452, 453).—The authors disagree with the theory of Stewart and Peterson (E. S. R., 33, p. 121) with reference to the cause of the brown coloration of the so-called niter spots in some western soils, and adhere to the theory of pigmentation of *Azotobacter*.

chroococcum as the cause of the brown coloration of the spots (E. S. R., 25, p. 815).

The origin of the "niter spots" in certain western soils, R. STEWART and W. PETERSON (*Science, n. s.*, 43 (1916), No. 1097, pp. 20-24).—This is a reply to the above, in which the authors reiterate their original theory regarding the origin of the brown niter spots (E. S. R., 33, p. 121). They conclude "that the nonsymbiotic bacteria are not responsible for the production of the nitrates noted in the niter spots of the affected soils of the arid West and their presence there is only incidental and of no more economic importance than their more abundant occurrence in other normal niter-free soils of the arid regions. The nitrates present in the niter spots are the direct result of the leaching and concentrating action of the ground water upon the nitrates preexisting in the country rock adjacent to or underneath the soil of the affected area. . . . The color is due to the solvent and decomposing action of the nitrates upon the old organic matter or humus in the soil." Experimental data are cited in support of the argument.

The variation of the fertility and productivity of the soil under the influence of natural conditions and dry air storage, K. GEDMOITS (*Trudy Sel'sk. Khoz. Khim. Lab. St. Peterb.*, 8 (1914), pp. 144-199; abs. in *Sel'sk. Khoz. i L'ezov.*, 245 (1914), Aug., pp. 630-633; *Zhar. Opytn. Agron.* (Russ. *Jour. Expt. Landw.*), 15 (1914), No. 4, pp. 807, 808; *Internat. Inst. Agr.* [Rome], Mo. Bel. *Agr. Intel. and Plant Diseases*, 6 (1915), No. 1, pp. 37-39).—Pot experiments with oats and flax on soils stored in dry air from one to six years following 1903 are reported, in which no fertilization, complete fertilization, complete fertilization without nitrogen, and complete fertilization without phosphoric acid were practiced.

A gradual increase in the oat crop without fertilizer with length of storage was observed, except in the fifth year of storage. "The same effect also occurred in the pots without nitrogen and without phosphate. With the complete fertilizer the greatest yield was obtained in the first year; there was then a considerable decrease in the second year, followed by a gradual increase, though the yield of the first year was never reached. In the case of flax with a complete fertilizer the harvest increased regularly during the four years after the first year, then remained almost constant. With the other series the changes corresponded to those of the oats."

As a check on the above experiments a series was conducted in which soils collected in various years were all tested in the same year (1908). "These experiments and many others carried out during a period of years show that the yield is always in direct relation with the length of storage of the soil. Chemical analysis shows a slight increase in the percentage of phosphoric acid soluble in 2 per cent citric acid and in acetic acid. In 1904 the citric acid soluble phosphoric acid was 0.0078 per cent and in 1909 the same soil gave 0.0096 per cent. The percentage of phosphoric acid in the oats and flax was also increased with the duration of storage of the soil. . . . Chemical analysis showed similar results with respect to nitrogen. . . .

"These results lead to the conclusion that storing the soil in dry air increases its productivity in proportion to the period of storage, and also increases in a corresponding degree the percentage of phosphoric acid and nitrogen in the crop."

The development of a dynamic theory of soil fertility, F. K. CAMEROS (*Jour. Franklin Inst.*, 181 (1916), No. 1, pp. 27-49, figs. 2).—The author reviews some of the more important features of the existing knowledge of soil fertility and points out that soil management involves the consideration of

all the natural factors affecting the same, singly and in total, and that each of these factors is in a continual process of change. "The problems of soil management are, therefore, essentially dynamic. . . . The properties of the soil are not merely the sum of the properties of the components, but the summation of these properties as they mutually affect and modify each other."

It must therefore be recognized "that the problems of soil fertility are no longer problems merely of soil composition or merely of a supply of plant food. The great fundamental questions now are: What are the processes, physical, chemical, and biological, taking place continually in the soil? What are their magnitudes and what are the rates of change? How do they affect one another? What are the differences between individual soils that are the expression of the resultants of these interdependent processes?"

The difference between rye and wheat soils, A. STUTZER and W. HAUPT (*Fühlings's Landw. Ztg.*, 64 (1915), No. 13-14, pp. 347-352).—In examinations of eight wheat soils and four rye soils no marked difference in chemical composition was observed, but mechanical analyses showed that the clay content and the content of fine particles in general were greater for the wheat than for the rye soils. These results are taken to indicate that, other conditions being approximately equal, mechanical analysis will probably in general serve as a basis for judgment as to whether a soil is better adapted to wheat or rye.

Studies of the influence of soil condition on the bacterial life and the transformation of matter in soils, H. R. CHRISTENSEN (*Centbl. Bakt. [etc.]*, 2. Abt., 43 (1915), No. 1-7, pp. 1-166, pls. 2, figs. 21; *Ber. Stat. Forschgs. Virks. Plantekult.*, 81 (1914), pp. 321-552, pls. 2, figs. 21; *abs. in Chem. Zeitbl.*, 1915, I, No. 13, pp. 700, 791; *Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 7, pp. 923, 924; *Zentbl. Agr. Chem.*, 44 (1915), No. 7, pp. 290-296).—A series of detailed investigations along lines similar to those previously noted (E. S. R., 18, p. 720), using Remy's method of cultures in inoculated solutions of mannite and a number of different soils for inoculation, are reported. The purpose was to study the relations between soil conditions and the activities of Azotobacter, the power of soils to ferment mannite and decompose peptone and cellulose, and the nitrifying power of soil.

It was found that the development of Azotobacter in mannite solution depended upon the presence of basic matter, either in the solution or in the soil used for inoculation. In no case was a growth of Azotobacter obtained with a base-free medium, but when the carbonates of calcium or magnesium were added a marked growth of Azotobacter was obtained in the solutions inoculated with raw cultures of Azotobacter. This is taken to indicate that the growth of Azotobacter in an inoculated lime-free mannite solution may indicate the presence of basic matter in the soil and that the method may serve to indicate the need of a soil for lime.

Experiments using mannite solutions with and without lime showed that the occurrence of Azotobacter is not so general as is commonly thought and that a sure indication of the basicity of a soil or of its need for lime can not be obtained by use of a lime-free mannite solution without inoculation with Azotobacter. It is concluded that the use of inoculated and uninoculated cultures will determine whether the absence of Azotobacter is due to the chemical or biological conditions of a soil, and that the occurrence and distribution of Azotobacter in soil are governed by its reaction and basicity. It is further concluded that Azotobacter practically never exist in acid soils and only seldom in neutral soils, and that the presence of basic lime and magnesia compounds is especially favorable for their growth.

Further experiments showed that a growth of Azotobacter on the addition of calcium sulphate to cultures of soils which had previously showed no

growth is an indication of the probable presence of alkaline carbonates in the soils. A marked development of Azotobacter in a mannite solution containing no phosphoric acid is taken to indicate that the soil used is probably not deficient in phosphoric acid.

It was found further that soils producing no fermentation of mannite in a lime-free mannite solution were very deficient in lime. This is taken to indicate that the degree of fermentation produced under such conditions serves as a measure of the amount of lime present in a form available to mannite-fermenting bacteria.

The addition of phosphoric acid to a peptone solution inoculated with decomposed peptone markedly aided the decomposition of the solution. The addition of carbon compounds did not accelerate decomposition, but humus and ferric phosphate did. Studies of the decomposition of peptone by soils, using inoculated and uninoculated cultures, showed that lowland moor peat soil possessed a much greater power for decomposing peptone than upland moor peat soil. The upland moor peat contained substances which inhibited peptone decomposition, but which were rendered inactive by adding calcium carbonate. Additions of calcium carbonate and phosphoric acid and of phosphoric acid alone to acid lowland moor peat favored peptone decomposition. Inoculation of the lowland moor peat cultures had no effect, but inoculation of the upland moor peat cultures markedly favored the decomposition of peptone.

In cultivated mineral soils peptone decomposition varied greatly. The phosphoric acid content of the soils especially influenced the degree of decomposition. All the soils tested appeared to contain sufficient humus for maximum peptone decomposition. With reference to the effect of inoculation of cultures with decomposed peptone the mineral soils were of two groups, namely, (1) those in which inoculation had little or no effect on peptone decomposition and which were in all cases basic, and (2) those in which inoculation markedly favored peptone decomposition and which were not basic. It is concluded that a soil of low peptone decomposing power forms an unfavorable medium for crop growth.

The decomposition of cellulose was usually found to be very small in humus soils. With upland and lowland moor soils practically the same differences were observed in cellulose decomposition as in peptone decomposition, except that the influence of chemical factors was more marked. Next to the content of basic lime and phosphoric acid, the availability of the organic nitrogen in peat was the factor controlling the decomposition of cellulose. In mineral soils it was found in all cases that the chemical condition of the soil mainly controlled cellulose decomposition, basic lime and phosphoric acid being the controlling factors.

In both humus and mineral soils nitrification was found to be governed mainly by their biological condition.

A list of references to literature bearing on the subject is appended.

On the presence of Azotobacter in Danish woods and on the value of Azotobacter cultures for the determination of the lime requirements in woodland, F. WEIS and C. H. BORNEBUSCH (*Forsl. Forsøgsrv. Danmark*, 4 (1914), No. 4, pp. 319-337; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 4, pp. 546-548).—Experiments using Beijerinck's nutritive medium to determine the Azotobacter content of soils from 64 different localities in Danish forests are reported.

Azotobacter was found in only two of the soils, both of which showed marked alkalinity. In culture experiments in which the soil in question was substituted for calcium carbonate in Beijerinck's solution positive results were obtained in 32 out of 54 cases. "In several cases the dry leaves fallen to the

ground were examined for *Azotobacter*, but always with negative results. In the cases in which it was looked for in arable soils in the immediate vicinity of woods whose soil did not contain any species of *Azotobacter* its presence was easily demonstrated, but the species was always *A. chroococcum*."

The following general conclusions are drawn: "Azotobacter is only exceptionally present in Danish forest soils. In some localities in which the soil contains much calcium carbonate *A. beijerinckii* and *A. vitreum* are present. Consequently, for the supply of nitrogen to the forest soils of Denmark some other micro-organisms, probably lower fungi, must be of importance. . . . The culture of *Azotobacter* in Beijerinck's nutritive solution in which the lime is replaced by 5 gm. of the soil to be studied is a rapid and easy way of showing if a woodland to be regenerated requires lime or not since the calcium compounds that favor the development of *Azotobacter* in such cultures seem to be the same which facilitate the development of those organisms which lead to the production and conservation of a good mold and favor the development of forest trees, especially of beeches."

A report along similar lines by Christensen is noted above.

The nonsymbiotic nitrogen-fixing soil bacteria and their importance in natural economy, M. DÜGELI (*Naturw. Wehnschr.*, 80 (1915), No. 42, pp. 657-664).—The author discusses the physiology and activity of the nonsymbiotic nitrogen-fixing soil bacteria, with special reference to their relation to soil fertility.

The fixation of potash by soil bacteria, S. KYROPOULOS (*Ztschr. Gärungsphysiol.*, 5 (1915), No. 3, pp. 161-166; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 10, pp. 1306, 1307).—Studies of the potash-fixing powers of soil bacteria in soil and solution cultures, using cane sugar as the nutritive medium in soil and the Beijerinck nutritive solution, showed, with different potash additions, no analytical proof of the assimilation of any considerable amounts of potash by bacteria.

The antizymotic action of a harmful soil constituent: Salicylic aldehyde and mannite, J. J. SKINNER (*Plant World*, 18 (1915), No. 6, pp. 162-167).—Experiments with wheat in distilled water and in nutrient solution cultures to determine the influence on the crop growth of mannite alone and in combination with salicylic aldehyde are reported. Mannite was used alone in concentrations varying from 10 to 200 parts per million in distilled water, and in a concentration of 100 parts per million in nutrient solution. In the distilled water cultures "growth in some of the mannite concentrations was about equal to that in pure distilled water. Some of the cultures produced larger growth and others made less growth than in distilled water." It was further found that "the mannite in the nutrient solutions containing all three of the nutrient elements underwent decomposition, there was a formation of nitrites and ammonia, and consequently the decomposition caused poor plant growth. The solution in which there was no phosphate was not a good medium for the development of bacteria, consequently there was no decomposition of the mannite. Mannite as such does not seem to be harmful to wheat seedlings, and when decomposition does not take place the material would seem to be used by the plants and an increased growth results."

In further wheat-culture experiments in nutritive solution to which mannite was added in amounts of 100 parts per million and salicylic aldehyde in amounts of from 1 to 100 parts per million, it was found that "nitrites and ammonia formed in the duplicate mannite solutions and in those solutions which contained mannite together with 1, 5, and 10 parts per million of salicylic aldehyde. In the solutions which had no plants 25 parts per million and

more of salicylic aldehyde prevented any decomposition in the solution. In the solutions with plants it required as much as 50 parts per million of salicylic aldehyde in the mannite solutions to prevent decomposition. . . . In every case 25 to 50 parts per million of salicylic aldehyde in nutrient solution with mannite prevented any bacterial action."

Salicylic aldehyde was harmful to the growth of plants as well as to bacterial life.

The importance of soil colloids for agriculture and forestry, P. ROHLAND (*Forstw. Cenbl., n. ser.*, 37 (1915), Nos. 6, pp. 257-263; 10, pp. 455-460).—An additional contribution to the subject is given, covering practically the same ground as previous articles (E. S. R., 34, p. 18).

Colloidal clay, P. EHRENBORG and G. GIVEN (*Kolloid Ztschr.*, 17 (1915), No. 2, pp. 33-37).—After a brief review of the work of others bearing on the subject, experiments with a highly plastic clay are reported, the results are taken to indicate that the colloids of clay exhibit all the general characteristics of emulsoids.

Moisture relations of some Texas soils, G. S. FRAPS (*Texas Sta. Bul.* 183 (1915), pp. 56, figs. 6).—Two years' studies supplementing experiments previously noted (E. S. R., 33, p. 619) on the moisture content of clay, black clay, loam, sand, clay loam, and black clay loam soils under different conditions and fertility treatments are reported. Curves are given showing the moisture content of the soils at different periods and the relation of the moisture to the rainfall.

It was found that the average quantity of water in soils after continued rains was 58 per cent of the water capacity measured in the laboratory, and the maximum quantity was 60 per cent. "The soils retained when saturated to a depth of 14 in. enough water for from 12.6 to 19.1 bu. of corn, or from 150 to 234 lbs. of lint cotton. The crop draws upon a greater depth of soil for moisture, but there are also great losses due to evaporation."

Both cultivation and manuring increased the quantity of water held at the ends of the wet periods. The soils retained at the ends of the dry periods, on an average of the two years, 44 per cent of the water capacity measured in the laboratory. The lowest quantities reached in 1911 were from 33 to 46 per cent of the water capacity; in 1912, from 21 to 41 per cent. Cultivation and manuring increased the water content of the soils at the ends of the dry periods and decreased the loss by evaporation. There was a variation of about 50 per cent in the capacity of the various soils to hold water during wet periods and to retain water during dry periods.

Absorptive power of soils of Mauritius, P. DE SORNAY (*Dept. Agr. Mauritius, Sci. Scr.*, Bul. 1 (1915) [English Ed.], pp. 18; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 10, pp. 1803, 1304).—Two series of experiments with representative soils taken from different parts of the island of Mauritius are reported, the purpose of which was to determine their absorptive powers for ammonium sulphate, potassium nitrate, potassium sulphate, sodium nitrate, and calcium superphosphate. The first series consisted of percolation and the second of leaching experiments. Preliminary experiments showed that these soils when saturated contained an average of about 40 per cent of water, and that their average moisture content to a depth of 1 ft. was about 19 per cent.

The results of the main experiments led to the conclusion that the absorption of free or alkaline bases always takes place and that its intensity varies according to the nature of the soil. "In Mauritian soils this absorption of bases is particularly high when the conditions of experiments represent as nearly as

possible those of practice; and it may be said that the soil will give back, but with great difficulty and only after very heavy rainfalls, the ammonia and the potash retained. So long as rain falls slowly enough to prevent washing the soil will absorb high quantities of water which will be stored in the soil and subsoil, the latter remaining the reservoir of the cultivated soil. The soluble salts which are carried away will not be lost for plant growth. Surface tension and capillarity will bring them back to the surface. If rainfalls are heavy and compress the surface of the soil, washing will begin and a certain amount of cultivated soil will be carried away, together with the manure it contains."

The adsorption of potassium by the soil, A. G. McCALL, F. M. HILDEBRANDT, and E. S. JOHNSTON (*Jour. Phys. Chem.*, 20 (1916), No. 1, pp. 51-63, figs. 3).—A résumé of literature bearing on the subject is given, and experiments with a sandy loam soil in its natural state and with the same soil when ground for four days in a porcelain-lined ball mill are reported. The object was to determine the amount of potassium absorbed from percolating solutions of potassium chlorid containing 62 and 78 parts per million of potassium. The flow of the solutions during percolation was maintained at the rate of about 50 cc. in ten minutes.

With the natural soil and the weaker salt solution, it was found "that the first ten-minute contact of the solution with the soil reduced its concentration from 62 parts per million to 40 parts per million. At the end of the second ten-minute period the strength of the solution is further reduced to 36 parts per million, but from this point the concentration of the solution rises until the fifth and last fraction is reached, when the concentration is within three parts per million of the concentration of the original solution. The amount of potassium retained by the soil rises gradually to 233 parts per million of the dry soil when 250 cc. of solution have passed through."

With the finely pulverized soil and the stronger salt solution, it was found "that the amount of potassium in the solution has been increased instead of leacased by its contact with the soil." This is explained in part on the basis that the soil gave up some of its potassium to the percolating solution, and in part on the basis of selective adsorption "in which the solvent (water) is adsorbed more rapidly than the dissolved potassium salt, with the result that the percolate is more concentrated than the original solution."

The absorption of the ultraviolet and infra-red rays by arable soil, J. F. FESTAN and G. MICHAUD (*Arch. Sci. Phys. et Nat. [Geneva]*, 4, scr., 39 (1915), Vo. 3, pp. 270-273, figs. 2; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. 'ntcl. and Plant Diseases*, 6 (1915), No. 6, pp. 796, 797; *Rev. Sci. [Paris]*, 53 (1915), I-II, No. 16, p. 376; *Sci. Abs., Sect. A-Phys.*, 18 (1915), No. 8, p. 401; U. S. Mo. Weather Rev., 43 (1915), No. 10, pp. 510, 511; *Chem. Zeitbl.*, 1915, I, Vo. 23, p. 1222).—Experiments on the absorbing power of calcareous, sandy, clayey, and humus soils, when dry and when damp, for the two invisible ends of the solar spectrum are reported, in which the photographic method was employed. The ultraviolet rays were isolated by filtering sunlight through a quartz lens covered with a very thin film of silver. A Wood filter was used for the separation of the infra-red rays.

It was found "that infra-red light is much less absorbed by damp soil of all four types than by dry and that the soils absorb these rays in the following ascending order: Calcareous, clayey, sandy, and humus. The ultraviolet light also is less absorbed by damp than by dry calcareous soil, but the difference is less for sandy soil and becomes imperceptible in the case of humus and clayey soils. The intensity of absorption is least in the case of calcareous soil, which

is followed by sandy soil, while it is greater for humus and clayey soils. The difference of behavior toward the rays of the two invisible ends of the spectrum is greatest in dry clayey soil. While this absorbs ultraviolet light very readily, it absorbs very little infra-red light."

Soil temperatures. J. W. LEATHER (*Mem. Dept. Agr. India, Chem. Ser., 4 (1915), No. 2, pp. 19-84, pls. 8, figs. 7*).—Two years' observations on the temperature of cropped and fallow alluvial soils at Pusa containing a high proportion of calcium carbonate are reported. The temperatures were taken by means of self-registering thermometers placed horizontally in the undisturbed soil at depths of 1, 2, 3, 6, 9, 12, 18, and 24 in.

It was found that the temperature of the surface soil varied naturally with the hour of the day and with the season, the seasonal variations being minimum in January and maximum in May. In bare fallow soil "the diurnal change of temperature extends to between 12 and 24 in. from the surface on most days in the year. At 12 in. it amounts to about 1° C., but at 24 in. it is doubtful whether it ever exceeds 0.1° in Bihar and probably does not exceed 0.2° in any part of India.

"There is a fairly close correspondence between the temperature of bare fallow soil at 1 in. from the surface and that of the air in the shade. Approximately the soil minimum at this depth is about 2° higher than the air minimum, and the soil maximum is about 3° higher than the air maximum. There is also a similarly close relation between the diurnal change of temperature in the soil (bare fallow) at 1 in. from the surface and in the air (shade), the diurnal change being about 1.5° greater in the soil at this depth than in the air. This diurnal change is least during the monsoon and greatest during the dry season. At the former season (June to September) it is about 10° in the soil (bare fallow) at 1 in. deep, and during the latter (in March and April) it frequently approaches 20°.

"The temperature of the soil near the surface (down to 3 or 4 in.) is above the mean temperature for only about 8 hours daily, while it is below it for about 16 hours. The lag in temperature is about 2 hours at 3 in. deep and about 8 hours at 18 in. from the surface. A change in the specific heat of the soil, due to change of moisture content, does not seem to affect the maxima or minima; but rainfalls during the dry season, causing a considerable change in the amount of water evaporating, have a marked effect. . . .

"The effect of a covering crop on the soil temperature is very marked, for it both prevents the surface soil from rising to the temperature which fallow land assumes and also modifies the diurnal change. Thus while the temperature of exposed soil at 1 in. deep rises to about 3° above that of the air, that of cropped land is about 2° below it, and while the temperature of exposed soil at the surface rises to probably some 20° above that of the air, the corresponding figure for cropped land is only some 2 or 3° even in March, while in the rains it is actually lower than that of the air. Also in respect of diurnal change, at 1 in. deep, while exposed soil suffers a change of some 20° in March, that of cropped land is only about 13° at the same depth, and during the monsoon, while exposed soil suffers a diurnal change of some 10° at 1 in. deep, that of cropped land is only about 3 to 4°."

Droughts, rainfall, and soil erosion (*Union So. Africa Senate, 4. Sess. 1. Parliament, 1914, June 19, pp. XII+55+XXVIII, pls. 2*).—This is a report of an investigation by a committee of the senate of the Union of South Africa regarding the occurrence and variation of rainfall in South Africa, the causes and extent of soil erosion, and the drying up of certain areas in the Union, with suggestions of possible remedial measures.

Among the general conclusions reached from this investigation are that while the distribution of rainfall varies widely in different parts of the country from year to year and month to month and in proportion to the distance from the coast, the available evidence goes to show that there has been no definite diminution in the total rainfall of South Africa during historic times. There is, however, some evidence of cyclic or periodic variations. While denudation of the forested and grassed areas has not appreciably affected the total rainfall, it has been an important factor in increasing soil erosion. Other important factors are the making of roads, tracks, or paths, and the grazing of stock. It is stated that the combined effect of these various agencies "has been calamitous in the extreme."

The conditions which favor soil erosion have also been responsible for the drying up of the lands in certain parts of the country. Increased surface run-off has been accompanied by less penetration of moisture into the soil, and the formation of numerous gullies and drainage channels has resulted in the lowering of the underground water. The evidence appeared to be unanimous and conclusive "that many parts of the Union, in spite of the apparent constancy of the total amount of the rainfall, have been slowly but surely drying up, the rate of desiccation varying with the differences of locality, soil, and gradients; and that such parts must sooner or later become useless and uninhabitable if the process proceeds unchecked."

Among the remedial measures proposed are conservation of water by means of dams and irrigation works, encouragement of fencing, the increase of vegetation, control of veld burning, afforestation and reseeding to grass, and more attention to drainage in the construction of roads and railways.

The prevention and control of erosion in North Carolina, with special reference to terracing, F. R. BAKER (*North Carolina Sta. Bul. 236 (1916)*, pp. 27, figs. 25).—This bulletin, prepared in cooperation with this Department, states that the area in which soil erosion is especially active in North Carolina is almost wholly within the Piedmont region, but that a considerable amount of the western Coastal Plain is subject to erosion, the whole area so affected covering over 10,000,000 acres. Methods discussed for the prevention of erosion are (1) proper cultivation, (2) tile drainage, (3) hillside ditches, and (4) terracing. The falling and level terraces are given the most attention.

"Of the two terraces the broad, level terrace is more ideal, but its use is limited to soils in good physical condition. The falling terrace can be more generally used and is probably best adapted to the conditions found generally in North Carolina. The fall of the terrace varies with the state of cultivation between 6 in. in 100 ft. and a dead level. The level terraces should be spaced three or four feet apart (vertical distance); and the falling terraces four or five feet apart (vertical distance). A broad mound should be maintained whether a level or falling terrace is used."

Useful accessories, including levels and terrace drags, are also described.

The increase of the ecological value of light soils by intermixing clay (Betonung), C. SCHNEIDER (*Fühlings's Landw. Ztg.*, 64 (1915), No. 13-14, pp. 352-366).—The author enumerates and discusses the factors influencing the ecological value of a soil, and, considering light sandy soils and heavy clay soils as representing practically the limits of soil texture, points out how a proper mixture of clay or clay soil with a light soil will indirectly increase the ecological value of the latter by favorably influencing the factors mentioned and resulting in a normal soil. A general classification of soils on the basis of their content of sand and clay is given, and the relations between the different classes and normal soils for different crops is discussed.

The use of dynamite in the improvement of heavy clay soils, L. E. CALL and R. I. THROCKMORTON (*Kansas Sta. Bul.*, 209 (1915), pp. 34, figs. 8).—A series of experiments to determine the effect of dynamiting on the yield of different field crops, on the physical condition, moisture and bacterial content, and nitrifying powers of the soil, on the leaching of salts in alkali soil, and on the growth and vitality of fruit trees is reported. From one-half to one stick of dynamite was placed from $2\frac{1}{2}$ to 3 ft. deep and from 15 to 20 ft. apart. While some benefits from dynamiting were observed in some cases, it was found that "in no instance was there improvement sufficient to pay the expense of dynamiting." The authors conclude that "heavy plastic clay soils will seldom, if ever, be found dry enough under field conditions in humid climates to be shattered or cracked by explosions of dynamite, and that the physical condition of such soils will usually be injured rather than benefited by dynamiting."

The box method of testing manurial requirements of soils, G. DE S. BAYLIS (*Jour. Agr. [New Zeal.]*, 11 (1915), No. 2, pp. 97-105, figs. 5).—A box culture method for testing the value of different fertilizer mixtures and for determining incidentally the factor or factors limiting the productiveness of a soil is described.

Liquid manure (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 16 (1915), No. 1, pp. 26-32, pl. 1, figs. 3).—Experiments on hay lands to determine the value of liquid manure applied at the rate of 16 tons per acre, as compared with barnyard manure applied at the same rate, and a complete artificial mixed fertilizer applied at the rate of 500 lbs. per acre, showed that the three manures produced very similar results, but on the average slightly in favor of the liquid manure. Methods of collection, storage, and distribution of liquid manure are briefly described.

The action of the nitrogen of sodium nitrate, ammonium sulphate, and lime nitrogen, S. HERKE (*Kísérlet Közlem.*, 18 (1915), No. 2, pp. 266-306).—Ten years' pot-culture experiments with barley, mustard, oats, and poppies on different soils to determine the relative values of sodium nitrate, ammonium sulphate, and lime nitrogen as sources of nitrogen are reported.

The kind of soil had a marked influence on the action of lime nitrogen. It had the most favorable action on loam soils rich in lime and humus, where it equaled ammonium sulphate in effectiveness. On sand soils rich in lime but poor in humus and on loam soils rich in humus but poor in lime, the lime nitrogen had a less favorable action than the other two fertilizers. Considering the effect of sodium nitrate as 100, in the first case the effect of ammonium sulphate was 92 and of lime nitrogen 62, and in the second case that of ammonium sulphate was 84 and of lime nitrogen 61. Lime nitrogen was in general favorable to the same plants as was ammonium sulphate, although its action was usually less marked. The final average results with all the crops and all the soil types showed that with sodium nitrate taken at 100, ammonium sulphate stood at 91 and lime nitrogen at 70.

The relative action of the nitrogen of lime nitrogen and of sodium nitrate, J. GYÁRFÁS (*Kísérlet. Közlem.*, 18 (1915), No. 2, pp. 307-325).—Three years' field experiments comparing the fertilizing action of sodium nitrate and lime nitrogen when used under winter rye, barley, and potatoes on meadow, and as a top-dressing for winter-seeded crops, showed that on the average, taking the effectiveness of sodium nitrate as 100, that of lime nitrogen was 66. No relation was observed between the kind of soil and the fertilizing action of lime nitrogen, except that on an excessively damp, acid meadow soil the lime nitrogen had little effect and in some cases was injurious.

Cause of the red coloration sometimes observed on decomposing Thomas slag with sulphuric acid, H. DITZ (*Jour. Prakt. Chem.*, n. scr., 91 (1915), No.

12, pp. 507-520; *abs. in Jour. Soc. Chem. Indus.*, 34 (1915), No. 18, p. 972).—Experiments are reported, the results of which are taken to indicate that the red coloration given by certain kinds of Thomas slag when decomposed with strong sulphuric acid is due to the presence of trivalent manganese, mainly in the form of a manganese-phosphoric acid compound. The color was also given by other kinds of basic slag to which potassium permanganate was added. By properly varying the conditions of temperature and oxidation it was possible to obtain, from the slag leaving the converter, a product giving a green-blue or red coloration with sulphuric acid. The oxidation of manganous oxide in slag, it is thought, can be promoted under certain conditions by the presence of free lime. It is considered probable that the proportion of ferrous oxide to manganese in the slag also has an influence on the formation of a compound giving a red coloration with sulphuric acid.

The pebble phosphates of Florida, E. H. SELLARDS (*Fla. Geol. Survey Ann. Rpt.*, 7 (1914), pp. 25-116, pl. 1, figs. 51).—This paper deals in detail with the origin, location, and conditions of deposition of the land and river pebble deposits of Florida.

Possible sources of potash in America, F. K. CAMERON (*Jour. Franklin Inst.*, 180 (1915), No. 6, pp. 641-651; *Amer. Fert.*, 44 (1916), No. 2, pp. 21-26; *Sci. Amer. Sup.*, 81 (1916), No. 2089, pp. 34, 35).—This is a discussion of desert basins, alunite, and kelp as possible sources of potash in America. It is concluded that "there are within the United States large stores of raw materials from which it is possible to obtain ample supplies of potash salts; that the technology of the subject is sufficiently developed to demonstrate the entire practicability of a supply from native sources, so far as physical factors are concerned."

Statistical potash fertilizer experiments in 1914, with special reference to top-dressings and meadow fertilization, M. HOFFMANN (*Mitt. Deut. Landw. Gesell.*, 30 (1915), No. 38, pp. 560-566).—A classified review of a number of experiments along this line is given.

The importance of fineness of subdivision to the utility of crushed limestone as a soil amendment, W. THOMAS and W. FREAR (*Jour. Indus. and Engin. Chem.*, 7 (1915), No. 12, pp. 1041, 1042).—The substance of this article has been noted from another source (E. S. R., 34, p. 133).

The lime magnesia ratio in soil amendments, W. THOMAS and W. FREAR (*Jour. Indus. and Engin. Chem.*, 7 (1915), No. 12, pp. 1042-1044).—The substance of this article has been noted from another source (E. S. R., 34, p. 133).

The effects of radio-active ores and residues on plant life, M. H. F. SUTTON (*Reading, Eng.: Sutton & Sons*, 1914, *Bul.* 6, pp. 15, figs. 4).—Box and laboratory experiments, described previously in a brief note by Bastin (E. S. R., 33, p. 123), to determine the influence of two radio-active ores containing, respectively, 8 and 9 mg. of radium bromide per ton, of radium mine residue containing the equivalent of 1.8 mg. of radium bromide per ton, and of black oxide of uranium, on the growth of radishes, lettuce, peas, tall nasturtiums, and flowering annuals, and on the germination of red clover, smooth stalked meadow grass, and rape, are reported in detail. The radio-active ores were added to the vegetables at rates of from 1 part of ore to 12 parts of soil, to 1 part of ore to 48 parts of soil, and to tall nasturtiums at rates of from 1:14 to 1:2,240 parts of soil. The radium residue was added to nasturtiums at the same rates as the ore. Black oxide was added to the flowering annuals at the rate of 1 part to 2,000 parts of soil.

The results obtained "afford some evidence that radium emanations possess the property of developing and increasing growth. Many of the radish, lettuce,

and pea trials which were dressed with radio-active ore showed considerable superiority over those grown in plain soil, but the cost of the ore far outweighed the worth of the larger crop. . . .

"No material difference in results was apparent between the trials with ore incorporated with the soil and those with ore placed at the bottom of the boxes or pots. The quantity and degree of radio-active material to insure the best return can not be definitely stated, but it would appear that a light dressing is likely to give as good results as a larger amount. In the trials with rape seed, the influence of the radio-active material in accelerating germination was most consistent in all the tests, but it was evident that a very small quantity of low-grade residue proved as effective as a considerable amount of ore containing a much larger proportion of radium."

In the laboratory germination tests "there is no indication that better results are obtainable with ore possessing considerable radio-activity than with residue of low value, nor have these trials generally proved superior to the 'controls.'"

The influence of radio-active earth on plant growth and crop production, H. H. RUSBY (*Radium*, 4 (1915), Nos. 4, pp. 68-74, 5, pp. 94-104).—The substance of this article has been previously noted from another source (E. S. R., 33, p. 123).

Some chemical aspects of the peat problem, G. T. MORGAN (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 16 (1915), No. 1, pp. 39-45, pls. 4).—This article deals with the products of the peat industry, referring in particular to the production of ammonium sulphate and peat ash as fertilizers.

Commercial fertilizers, H. E. CURRIS and W. ROPES (*Kentucky Sta. Bul.* 196 (1915), pp. 239-371).—This bulletin contains the results of analyses and estimated valuations of 734 samples of fertilizers and fertilizing materials offered for sale in Kentucky during 1915.

"The results of these analyses show that in most cases the samples analyzed have come fully up to the guarantee, or where there is a slight deficiency in one ingredient, it has been made up by an excess in one or both of the other ingredients. In a few instances, the deficiency in one ingredient, while fully made up by an excess of the other ingredients, is still too large to be considered acceptable."

AGRICULTURAL BOTANY.

Experimental studies in the physiology of heredity, F. F. BLACKMAN ET AL (*Abs. in Rpt. Brit. Assoc. Adv. Sci.*, 84 (1914), pp. 245-247).—This is a report on work being conducted by Edith R. Saunders, R. P. Gregory, and Miss A. Gairdner.

In the study of half-hoariness in stocks and its relations to the glabrous and hoary forms a new half-hoary race has been obtained, which is being employed in a new series of experiments. Progress is reported in the further study of gametic coupling.

It has been found that the double-flowered plants, at least in some strains, make a more rapid and vigorous growth than the singles.

A beginning has been made in the work of obtaining a complete series of types of known factorial constitution for use in further study of the inter-relations between the factors determining hoariness and sap color.

Experiments investigating the cytology and genetics of certain giant races of *Primula sinensis* found to be in tetraploid condition have given results which are summarized in the statement that reduplication of the chromosomes is accompanied by a reduplication of the series of factors.

The investigations of Gregory on inheritance of green, variegated, and yellow leaves in *Primula* have been noted previously (E. S. R., 34, p. 228).

Heredity and mutation as cell phenomena, R. R. GATES (*Amer. Jour. Bot.*, 2 (1915), No. 10, pp. 519-528).—This is a discussion of several characters and their inheritance in certain *Ceuthoras*, based upon the conceptions which the author favors of variation and inheritance, namely, the process by which new differences arise and the process by which they are perpetuated.

Not only do parallel mutations occur independently in species widely apart, but wide differences are found in the types of change which give rise to them. Emphasis is laid on the statement that each mutation is the result of a cell change which is repeated in every part of the organism, having originated in the fertilized egg. A mutant is such because not only germ cells but somatic cells contain a certain peculiarity. It is thought that a female animal, like a mutant, is somatically distinguished by a different chromosome content in all its tissues and that many important implications lie in this fact.

The *Oz. rubricalyx* character is considered an example of a mutation fundamentally chemical, though the precise nature of the change by which it is produced is as yet unknown. It is thought probable that *Oz. rubricalyx* is also a cell mutation, the nuclei in all parts containing a descendant of the original changed chromosome. Parallels to this mutation are found in such plants as the copper beech and the red sunflower, which belong to widely separated groups.

Genetical studies on Oxalis, S. NOHARA (*Jour. Col. Agr. Imp. Univ. Tokyo*, 6 (1915), No. 2, pp. 165-182, pl. 1).—The results are given of a study of several forms of *Oxalis* growing in Tokyo and its vicinity. A number of these forms, which are characterized by differences in flower and leaf color, were grown as pedigree plants and used in crossing experiments.

As a result of the culture work some of these forms were found to be distinct biotypes. In the materials employed the presence or absence of purple in the corolla and leaves was used as a distinctive character. This color is said to be due to the presence of a purple cell sap. Four of the five pedigree cultures were found to be pure types, while one split into forms of the pure types upon self-fertilization. In the hybrids the presence of a factor or factors of purple color was found dominant over the absence of the same. An F₁ generation was found intermediate in color intensity between its parents. The two reciprocals of any of the hybrids were found to be of exactly the same nature so far as the author's investigations are given.

Self-pollination and the possibility of artificial cross-pollination in rice, R. FARNETI (*Atti Ist. Bot. R. Univ. Pavia*, 2, ser., 12 (1915), pp. 351-362, pl. 1).—The author has studied the possibility of accomplishing artificial fertilization in rice. It was found that with sufficient skill and patience this could be brought about at the proper stage by introducing a fine instrument through the minute opening at the points of the glumes. It was, however, difficult to avoid causing self-fertilization or injury resulting in sterility.

The nature of peloria in flowers, M. J. SIRKS (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 14 (1915), No. 2, pp. 71-79).—The author, giving results of his own studies, holds with Vöchtling (E. S. R., 9, p. 1027) that peloria is due, not to external conditions primarily, but to the operation of causes which are inferior to the plant itself and bound up with the constitution of the species. In the cases studied, peloria and fasciation appear to be the results of independent processes. A bibliography is given.

The nature of peloria, M. J. SIRKS (*Arch. Néerland. Sci. Exact. et Nat.*, Ser. 3 B, 2 (1915), No. 2, pp. 239-283, figs. 3).—This is a more extended presentation of the material above reported, with a discussion of heredity and of external influences as related to peloria.

Recent studies on the formation of flower coloring materials, ELISABETH SCHIEMANN (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 14 (1915), No. 2, pp. 80-96).—This is a brief discussion of the results of studies reported during 1902 to 1914 by a number of authors listed with their contributions. The material, which is regarded from the standpoint of Mendelian splitting, is discussed under the main heads of the glucosid-splitting enzym, the oxidases, the limiting factor, and the chromogens.

The relation between vegetative vigor and reproduction in some Saprolegniaceæ, A. J. PIETERS (*Amer. Jour. Bot.*, 2 (1915), No. 10, pp. 529-576, figs. 2).—The author, reporting a study of *S. feraz*, *S. monica*, *Achlya racemosa*, and *A. prolifera*, states that there is no constant relation between vegetative growth and sexual reproduction when the concentration of the food supply exceeds the minimum requirement of the species therefor. This is not far from 0.1 per cent of peptone for the production of both sporangia and oögonia.

Tendencies developed by a mycelium while growing vegetatively may affect the number and character of the reproductive organs produced later under different conditions. Maltose and levulose are especially favorable among the carbohydrates used as regards vegetative growth, and the latter has an especial value for the production of oögonia. Sucrose is probably not used by species of Saprolegnia or of Achlya unless it is first inverted by some other agency. Phosphates tend to increase the reproductive capacity of the fungus.

The achievement of comparable results requires the use of a medium of definite and known composition.

A bibliography is given.

On the influence of nutrition upon the development of sexual organs in the fern prothallia, I. NAGAI (*Jour. Col. Agr. Imp. Univ. Tokyo*, 6 (1915), No. 2, pp. 121-164, pl. 1, figs. 7).—On account of recent investigations showing the effect of nutrition on the development of sex in plants, the author made a study of the influence of nutrition on the development of sexual organs in the gametophytes of *Osmunda regalis japonica* and *Asplenium nidus*.

The prothallia were grown from spores in Knop's solution, and it was found that the development of antheridia and archegonia was dependent upon the concentration of the solution in which they were grown. The prothallia of *O. regalis japonica* grown in solutions which lacked calcium and magnesium salts were almost completely sterile. Starch was found to accumulate abnormally in the chlorophyll bodies of prothallia of *Osmunda* which were grown under a nitrogen-hungry condition, but a normal condition was soon restored if weak solutions of ammonium salts and nitrates were supplied.

Relation of moisture to seed production in alfalfa, J. N. MARTIN (*Iowa Sta. Research Bul.* 23 (1915), pp. 302-324, figs. 2).—A report is given of investigations conducted to determine the cause of the frequent failure of alfalfa to produce seed in Iowa.

As a result of laboratory and other experiments, it was determined that the proper functioning of alfalfa pollen is the limiting factor in seed production. For the germination of the pollen, a proper supply of water is required, and a certain ratio between the moisture delivered by the stigma and the moisture of the air was found necessary. When the optimum supply of soil and atmospheric moisture is present, an increase in soil moisture resulting in an increased moisture delivery of the stigma, or a change in the atmospheric moisture disturbs the supply for pollen germination and prevents fertilization. The blasting of seed is said to be commonly due to arrested development, and this may be brought about by inability on the part of the plant to furnish the proper water and food supply, or it may be due to pathological conditions to which the seed is susceptible under drought conditions.

The presence and physiological significance of tannin in plants, C. VAN WISSELINGH (*Bot. Centbl., Beihefte*, 32 (1915), 1. Abt., No. 2, pp. 155-217, pls. 1).—The author describes researches carried on by himself with *Spirogyra maxima* as regards tannin. It is claimed that this plant contains a substance closely allied to gallotannin in the cell sap, and that the precipitate obtained by the use of certain bases is a tannin and not a nitrogen product. Antipyrin and caffeine have proved to be well adapted to the demonstration of tannin in living cells without injury thereto.

It is thought that in case of *S. maxima* the tanin present in the cell sap is not an excretion product or a reserve material, but a solute in process of utilization by the plant along with other dissolved substances.

Correlations appear to exist between tannins and other bodies, as chromato-chromes and starches.

Elaeoplasts in monocotyledons and dicotyledons, I. POLITIS (*Atti Ist. Bot. R. Univ. Pavia, 2. ser.*, 12 (1915), pp. 345-350).—The author claims to have found elaeoplasts in 27 species representing 19 genera of monocotyledons, and in the Malvaceae among the dicotyledons. They are to be regarded as the specific organs of the cell which are concerned with the elaboration of oily material. Elaeoplasts are regarded as fundamentally similar in substance to the nucleoli. In bulbs, it is stated, new elaeoplasts are formed with each resumption of vegetative activity.

The electrical conductivity of sap in vegetable tissues, EVA MAMELI (*Atti Ist. Bot. R. Univ. Pavia, 2. ser.*, 12 (1915), pp. 285-297).—The author shows that successive degrees of torsion or pressure to which the tissues of *Opuntia ficus indica* and of *Agave americana* were subjected gave corresponding increases in the conductivity of the expressed sap.

In case of *Diotostemon hookeri*, *Aloc grandidentata*, and *A. africana*, permitted to dry slowly at from 16 to 20° C., the specific conductivity diminished at first, but later increased. In case of the last two of these and of *A. striata*, it appears that the specific conductivity decreases with the age of the organs.

In *O. ficus indica* and *Agave* sp., the specific conductivity of leaf tissue from the basal region exceeded that from the apical portions.

Studies on wilting, drying, and returgescence of plants, H. HOLLE (*Flora [Jena]*, n. ser., 8 (1915), No. 1-3, pp. 73-126, figs. 6).—The author has studied various plants as to the conditions in the vascular elements in wilting or drying shoots, the changes in living parenchyma cells while drying out, the relations of air to drying cells, and the restoration of turgor, including the influence of temperature in this connection. He has also considered some implications of water movement theories.

It is stated that in the neighborhood of wounds the concentrating cell sap withdraws water from the uninjured cells. The cell membranes shrink with the diminution of the cell contents. The shrinking of the cell wall is noted in dead as well as in live cells. Small, gas-filled spaces may appear in the parenchyma cells as they dry, but they do not restore the form of the crinkled cell membrane. Thin walled parenchyma cells show no such bubbles, being pressed together in a compact mass. While dead cells are losing their water, tension tensions are set up of various degrees of intensity before the gas bubbles appear. Penetration of membranes by air in case of pressures of one atmosphere or less does not occur so long as the cell is filled with water. Restoration of turgor in detached shoots occurs in warm water somewhat more quickly than in cold, within certain limits of resistance of the cut surface.

A bibliography is appended.

Some relations of plants to distilled water and certain dilute toxic solutions, M. C. MERRILL (*Ann. Missouri Bot. Gard.*, 2 (1915), No. 3, pp. 459-506,

pls. 4, figs. 4; *Amer. Jour. Pharm.*, 87 (1915), No. 12, pp. 549-555; 88 (1916), Nos. 1, pp. 12-22; 2, pp. 71-82, figs. 3; 4, pp. 156-164, fig. 1).—Briefly reviewing related contributions, the author outlines his own work with *Pisum sativum* and *Vicia faba*.

Renewing the distilled water every four days increased the growth of the top and roots, lengthened the life of the plants, and continued growth longer after they were placed in a full nutrient solution. The period between 5 and 10 days in distilled water appears to be a critical one for these plants as regards complete recovery in a full nutrient solution. Sterilizing the distilled water every four days by boiling for $\frac{1}{2}$ hour favored continued growth. Greater total exosmosis was obtained in the renewed than in the unrenewed distilled water.

Normal plants grown for some time in a full nutrient medium and then transferred to distilled water exhibited at first greater excretion than absorption of electrolytes, but after a day or two absorption was in excess and conductivity declined, sometimes for a considerable period of time. The conductivity curve of the full nutrient solution fell for about the first 15 days of growth thereto to a horizontal which was maintained for about 50 days. The growth curve was in general opposite to that of conductivity. Exceptional features are also noted. Greater deterioration of the roots in distilled water occurred if the plants had not previously been grown in full nutrient solution.

The conclusion is thought to be justified that pure distilled water is not of itself toxic or injurious to plants, and that various other factors must aid in causing the deterioration observed in this connection. The author inclines to the view that, while exosmosis of food materials or nutrient salts is not responsible for the injury observed, the question of food relations does play an important part in the incipiency of the trouble, this being quickly followed by factors initiated as a result of the immeical food or nutrient relation. It is thought possible that in the absence of available food the tissues of the plant begin to disorganize and thus fall a ready prey to fungus and bacterial action, which continues and extends the injurious effects.

A bibliography is given.

Electrolytic determination of exosmosis from the roots of plants subjected to the action of various agents, M. C. MERRILL (*Ann. Missouri Bot. Gard.*, 2 (1915), No. 3, pp. 507-572, figs. 18).—In this paper are given the results of studies on the effects of agencies which are considered as actively injurious, as distinguished from the operation of the agencies considered in the paper above noted. An attempt was also made to determine the approximate boundary between normal and abnormal exosmosis.

It was found that pea seedlings grew better in distilled water in which exosmosis from previously treated plants of the first crop had occurred than in fresh distilled water or in that in which untreated plants had been grown. Peas or horse beans grew better in fresh distilled water than in distilled water in which seedlings had already grown for 21 days.

Abundant exosmosis may occur from treated plants, the roots remaining normal in appearance. Anesthetic vapors cause marked exosmosis after long exposure, the order of greatest effectiveness being chloroform, illuminating gas, and ether. The time limits for the exposure to extremes of temperature in relation to exosmosis were determined, and comparison was made between the effect of dry and that of moist heat. The exosmosis curves were found for various organic compounds, which, at the concentrations used, produced marked excretion, and the effects of salts, singly and in pairs and with anesthetics in solution, were ascertained. Antagonistic relations were not discovered in the course of this work.

The effects of heat and cold are considered as resulting in a complete or incomplete disorganization of the cell, depending upon the duration of exposure and a consequent escape of some of the contents. The observations here recorded are not considered to substantiate the view that anesthesia is a reversible process, the excretion process induced by an anesthetic conforming in every way to an irreversible chemical reaction. It is further believed that the results obtained by antagonistic pairs of salts and by single salts are also to be explained, as far as resulting exosmosis is concerned, in the specificity of the action of each.

A bibliography is appended.

The question of the toxicity of distilled water, R. P. HIBBARD (*Amer. Jour. Bot.*, 2 (1915), No. 8, pp. 389-401).—The author refers to articles by Livingston, Hoyt, and True, respectively (E. S. R., 19, p. 13; 31, pp. 32, 730) as affording a complete summary of the work done in the past on the toxic effects of distilled water. This is said to have been about equally divided between animal and plant physiologists. He then details his own investigations, employing as indicators the roots of *Lupinus albus* and relating first to the problem of adjustment and second to that of toxic root excretions.

It is held that by some process of acclimatization or adjustment, lupine seedlings give better growth in distilled water if change to that medium from tap water is made gradually rather than suddenly, and that this fact should never be neglected in cultural work. It appears also that roots of lupine seedlings excrete a substance that inhibits growth therein and produces also abnormalities of development as regards form and direction. It is thought that the harmfulness of distilled water may be considered as due, not to any one predominant factor, but to a resultant of many, consisting of a disturbance of the normal equilibrium of the various chemical and physical interactions within the organism and between it and its environment.

Plant records of an expedition to Lower California, E. A. GOLDMAN (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 16 (1916), pt. 14, pp. 309-371+XIII, pls. 91).—A list is given of plants collected in Lower California in 1905 and 1906, along with notes on distribution and descriptive, ecological, and economic data. The work includes descriptions of three new species of oak, *Quercus brandegeei*, *Q. idonea*, and *Q. devia*.

New or noteworthy plants from Colombia and Central America, V, H. PITIER (*U. S. Nat. Mus., Contrib. Nat. Herbarium*, 18 (1916), pt. 4, pp. 143-171+IX, pls. 24, figs. 10).—The author describes a number of trees and shrubs of Central America and northern South America which were hitherto imperfectly known or not described.

FIELD CROPS.

Moisture content and shrinkage of forage and the relation of these factors to the accuracy of experimental data, H. N. VINALL and R. McKEE (*U. S. Dept. Agr. Bul.* 353 (1916), pp. 37).—This bulletin is a report on a series of experiments made during 1914 to secure data on which to base a sampling system giving greater accuracy to field tests in forage experiments. The plan consists essentially in taking small samples at the time of weighing field-cured or green material for use in determining the moisture content of the material and applying the data in reducing the yield either to an air-dry or to a dry-matter basis.

In the experiments described the efficiency of correcting ordinary green and field-cured forage weights with 2, 4, 6, 8, 12, or 16 lb. samples was determined with a number of crops at different points. Of ordinary field-cured forage 100 lbs. was taken from the shock or windrow and 500 lbs. of green forage was

taken immediately after cutting and placed on a canvas to prevent loss of weight other than moisture. When this forage had become sufficiently dry the lots were placed in burlap bags and kept in an open shelter until they ceased to lose weight. Composite samples of 2, 4, 6, and 8 lbs. of field-cured forage, part from the outside and part from the inside of shocks, were secured at the same time and from the same material as the 100-lb. lots before mentioned and allowed to become perfectly air-dry. Samples 4, 8, 12, and 16 lbs. in size of green forage were taken immediately after cutting and were treated similarly. Samples were replicated five or six times to check the variation due to sampling. All samples were taken at the stage of maturity generally recognized as the proper cutting time for each crop. The data secured are arranged in tables and discussed.

The study of the use of samples in correcting forage yields indicated that air-dried samples, while a little less accurate than oven-dried samples, can be relied upon for all practical purposes in correcting forage yields. Much greater extremes were found in the samples of field-cured material than in the samples of green material. It is believed that with the proper care in sampling correction by means of samples can be accurately made from either green or field-cured material. The percentage of moisture in different crops when these are ordinarily harvested for forage was as follows: Alfalfa at Chico, Cal., 75 to 78 per cent, average 76.9 per cent; alfalfa at Arlington Farm, Va., 74 to 76.5 per cent, average 75.2 per cent; tall oat-grass and orchard-grass mixture at Arlington Farm, Va., 71 to 73 per cent, average 72 per cent; timothy at New London, Ohio, when in full bloom, average 67.2 per cent; sorghum at Amarillo, Tex., 70 to 73 per cent, average 71.2 per cent. The average amount of moisture found in field-cured material was as follows: Alfalfa, 22.3 per cent; timothy, 20.3 per cent; tall oat-grass and orchard-grass mixture, 29 per cent; sorghum, 43.2 per cent. It is stated that the moisture content of field-cured material varies so widely that it can not be foretold with accuracy.

The following results were secured in the study of the relation of the moisture content to the stage of development: Alfalfa at Chico, Cal., very young (12 in. high), 78.9 per cent; one-tenth in bloom, 77.1 per cent; full bloom, 74.6 per cent; past full bloom, 73.4 per cent. Sorghum at Amarillo, Tex., very young, 90.6 per cent; shooting for heads, 87.1 per cent; beginning to head, 84.8 per cent; full bloom, 80.4 per cent; seed ripe, 75.3 per cent. The results with sorghum at Hays, Kans., showed practically the same gradations as at Amarillo, Tex. Timothy at New London, Ohio: Very young (10 to 12 in. high), 77.5 per cent; just heading, 76.6 per cent; early bloom, 71.4 per cent; full bloom, 67.2 per cent; leaves drying, 58.6 per cent; seed mature, 51.2 per cent.

The results of a study of the rate of loss of moisture in forage during the early stages of curing are shown in the following table:

Approximate moisture losses in different crops during the first four hours of curing.

Crop and location.	Moisture loss.				
	4 hour.	1 hour.	2 hours.	3 hours.	4 hours.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Alfalfa at Chico, Cal.....		17	35	65
Alfalfa at Arlington Farm, Va.....	6	14	23	28	42
Tall oat-grass and orchard grass at Arlington, Va.....	5	12	24	30	34
Timothy at New London, Ohio.....	6	10	18	25	30
Sorghum at Hays, Kans.....	2	5	9	12	13

It was observed that the rate of loss of moisture after cutting differed in different varieties of the same crop as well as in different crops. Arabian alfalfa lost moisture faster than Peruvian or ordinary alfalfa in the first one or two hours after cutting, but the total percentage of moisture was about the same in the three varieties. A high percentage of leaf surface in alfalfa was correlated with a rapid loss of moisture immediately after cutting, but it did not indicate a high moisture content.

Studies of the shrinkage in hay after storing and variation of moisture content due to changes in atmospheric humidity showed that at Chico, Cal., baled oat hay in 1914 lost 8.1 per cent in weight between June 1 and August 31, and gained 5.9 per cent of the original weight from August 31, 1914, to February 25, 1915. The results at this point indicated that even baled hay responds noticeably to changes in atmospheric humidity. Results secured at New London, Ohio, with loose timothy indicate a shrinkage of 8.6 per cent in one lot and 15.6 per cent in another lot when the hay was stored in a barn for about three months. The effect of a week of rainy weather was indicated by an increase of weight in the loose hay.

A method of correcting for soil heterogeneity in variety tests, F. M. SURFACE and R. PEARL (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 22, pp. 1039-1049, figs. 4).—This article, from the Maine Experiment Station, proposes a method for use in correcting for differences in the soil of different plats, when the plats are arranged in a certain definite way.

The method involves in the first place the determination of the probable yield by the contingency method. This calculated yield is taken as representing the most probable yield of each plat on the supposition that they have all been planted with a hypothetical variety whose mean yield is the same as the observed means of the field. This calculated yield is used as a basis for determining a correction factor. If the calculated yield of a given plat above the mean of the field, it is regarded that the soil of this plat is better than the average of the field and a corresponding amount is deducted from the observed yield. If the calculated yield is below the average, a proportional amount is added to the observed yield in order to make the plats comparable. The results are considered still more comparable if the correction factors are based upon the percentage of the mean rather than upon the absolute figures. An application of the method upon experimental plats led to results which are believed to represent the truth more nearly than do uncorrected yields.

Colonial plants.—Textile plants, H. JUMELLE (*Les Cultures Coloniales. Plantes Textiles*. Paris: J. B. Bailliére & Son, 1915, vol. 6, 2. ed., enl., pp. 118, figs. 33).—This is part 6 of the second revised edition of the author's work E. S. R., 33, p. 437), treating of kapok, cotton, coconut fiber, New Zealand hemp, Saussevieria, abacá, sisal hemp, agave, ramie, jute, hibiscus, and sann.

The curing of blue-grass seeds as affecting their viability, H. GARMAN and E. C. VAUGHN (*Kentucky Sta. Bul.* 198 (1916), pp. 27-39, pls. 5).—Germination tests of blue-grass seeds subjected to different temperatures in the process of curing showed that seeds allowed to heat to 140° F. even for a short time are worthless, and that the seeds should never be permitted to heat above 122° F., as prolonged heating even at this temperature reduces the percentage of germination.

To show the influence of handling on the quality of the seeds, the following averages are given of germination percentages taken from records made in 1915; 12 tests of samples taken from bags at warehouses averaged 33.25 per cent; 18 samples from ricks at warehouses averaged 57.44 per cent; 12 samples from ricks in barns averaged 58.2 per cent; 10 samples from ricks out-of-doors

averaged 69.3 per cent; and 8 tests of hand-stripped samples averaged 73.62 per cent.

Observations by the authors led to the conclusion that the seeds are best when harvested in that locality from about June 15 to 20. Methods of harvesting and curing are described with a view to getting cleaner seed and higher viability.

Testing seed corn, C. G. WILLIAMS (*Mo. Bul. Ohio Sta., 1 (1916), No. 8, p. 96*).—The yields of corn for the years 1911–1915, inclusive, in an experiment at the Ohio Station averaged 54.49 bu. per acre from untested seed and 58.80 bu. from tested seed. It is pointed out that this increase of 4.11 bu. per acre at 50 cts. per bu. represents a return of \$6.85 an hour for the time spent in testing.

The moisture content of 5 varieties of corn was determined early in November in 1908; 1914, and 1915, the average being 19, 28.6, and 33.5 per cent, respectively. Attention is called to the high moisture content of the 1915 crop and its relation to the percentage of germination.

Cotton experiments, 1915, H. B. BROWN (*Mississippi Sta. Bul. 173 (1916), pp. 1–27, 29, figs. 3*).—This bulletin reports in part the results of cotton experiments conducted in 1915 at the Mississippi Station and the Holly Springs and Delta substations. Results of similar experiments have been previously reported (E. S. R., 32, p. 734). Temperature and rainfall records presented are regarded as showing practically no relation between cotton yields and rainfall and temperature fluctuations during the growing season.

A test of 21 varieties or strains at the station indicated the general superiority of Wanamaker-Cleveland, Cleveland Big Boll, and Miller among the big boll varieties, although on rich bottom lands under boll-weevil conditions the smaller early-maturing varieties such as Trice and Dodds Prolific will possibly be more satisfactory. Express is regarded as ranking as a long-staple cotton for boll-weevil conditions and Unknown as comparing very favorably with Express.

Several varieties grown on silty loam land infested with cotton wilt were tested as to their resistance to the disease. Simpkins and Trice, known to be susceptible, were badly attacked while Dixie and Covington-Toole, resistant varieties, had practically no plants that showed external symptoms of the disease, and although a number of the plants were infected, their yield was not affected materially. Wanamaker-Cleveland, a variety of medium resistance which led in production per plant, is considered as possibly the best cotton obtainable when the crop must be grown under the conditions of the experiment.

Plats sprayed with a proprietary preparation to combat the boll weevil showed a total yield of seed cotton of 1,164 lbs. per acre for April plantings and 264 lbs. for June plantings, as compared with 1,176 and 256 lbs., respectively, for unsprayed plats.

The 6-year average yield of seed cotton per acre in a test of growing plants 1, 2, or 3 ft. apart in the drill was in favor of the 1-ft. distance with a yield of 1,643.5 lbs. The 5-year average yield of seed cotton per acre in a test of different distances between the rows was in favor of 3 ft., the smallest distance, with a yield of 1,446 lbs.

The results of the variety tests at Holly Springs, which are given in a table, indicated that Wanamaker-Cleveland, Cleveland Big Boll, Miller, and Triumph are among the leading varieties for the hill section of the State. Results of a variety test at Delta branch station are tabulated but no conclusions with reference to individual varieties are drawn. The variety averages for the three stations and the rank of varieties grown the last five years on the basis of money value per acre are also presented in tables.

Report on variety tests of cotton for 1915, R. Y. WINTERS and V. R. HERMAN (*Bul. N. C. Dept. Agr.*, 37 (1916), No. 2, pp. 3-15).—On the station farm near Raleigh 37 short-staple varieties ranged in yield from 926 to 1,417 lbs. of seed cotton per acre, and 7 long-staple varieties from 976 to 1,297 lbs. of seed cotton per acre. In this test the highest yielding strains produced a shorter fiber. A comparison of five strains of Cleveland Big Boll and six strains of King showed that strains of the same variety may differ in character of plant, size of boll, shape of leaf, and yield.

In a test at Iredell farm of 21 short-staple varieties of cotton including the earliest medium boll and the small-boll varieties, the yields ranged from 370 to 1,261 lbs. of seed cotton per acre. The yields of the different varieties and strains are given in tables.

Japanese cane, J. M. SCOTT (*Florida Sta. Bul.* 129 (1916), pp. 21-44, figs. 4).—The culture and uses of Japanese cane are discussed, and the results of culture and fertilizer tests, together with analyses and other data as to the chemical composition of the crop with reference to its feeding and fertilizer value, are reported.

In the fertilizer experiments, conducted on 8 plats from 1909 to 1914, inclusive, 112 lbs. of dried blood, 72 lbs. of sulphate of ammonia, 84 lbs. of muriate of sulphate of potash, and 224 lbs. of acid phosphate per acre were used in different combinations. One plat received in addition in 1909, 1911, and 1913 an application of 2,000 lbs. per acre of ground limestone. The yields in tons of green material per acre in 1909 ranged from 16.10 on the plat receiving dried blood and acid phosphate to 27.03 on the plat receiving dried blood, sulphate of potash, acid phosphate, and ground limestone. The yields decreased greatly from the first to the sixth year and the averages ranged from 7.55 to 13.7 tons of green material per acre on the different plats. The results showed in general that on the soil on which the cane was grown potash was most beneficial, and nitrogen appeared to be next in importance. Ground limestone acted as a temporary stimulant and no results were apparent except from the first application. The method of fertilizing the soil had no effect on the percentage of sucrose in the juice.

A test of replanting cane on each of the 8 plats in 1915 gave yields of green material per acre ranging from 18 to 31.9 tons. It is believed that better yields of Japanese cane will be obtained by replanting every third or fourth year.

Sudan grass, C. G. WILLIAMS (*Mo. Bul. Ohio Sta.*, 1 (1916), No. 3, pp. 67-70, fig. 1).—Notes are given on the seeding, harvesting, and feeding value of Sudan grass. The average yield of Sudan grass at the station for the years 1912-1914, inclusive, was 4.3 tons of dry hay per acre as compared with 3.9 tons of German millet.

Manurial experiments on sugar cane, 1912-1914, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 13 (1914), No. 82, pp. 227-234, pl. 1, fig. 1).—These experiments were conducted under the control of the Board of Agriculture on the Brechin Castle, Esperanza, and Malgretoute estates. On each estate, of the eight plats devoted to the work, the first four, constituting a nitrogen series, received a complete application, the fifth plat nitrogen and phosphates, the sixth nitrogen and potash, the seventh nitrogen alone, and the eighth was a control. Nitrogen was applied in all cases at the rate of 45 lbs. per acre, phosphates in the form of dissolved bone at the rate of 40 lbs., and potash in the form of the sulphate at the rate of 23 lbs. with the exception of plat 6 which received 40 lbs. In the nitrogen series, plat 1 received calcium nitrate, plat 2 sodium nitrate, plate 3 calcium cyanamid, and plat 4 sulphate of ammonia.

On the Brechin Castle estate plat 1, receiving the calcium nitrate, gave the largest profit, \$3.11 per acre, but in no case was the increase resulting from fertilizer treatment sufficient to pay for the cost of the fertilizers. On the Esperanza estate the calcium nitrate plat was also the best, showing an increase of \$8.30 in the value of the crop produced as compared with the control plat. All plats treated with sulphate of ammonia showed a loss. On the Malgretoute estate the results in no case showed an increase sufficient to pay for the cost of applying the fertilizers. At this place an additional plat which received an application of Peruvian guano at the rate of 3 cwt. per acre gave a profit of \$11.04 per acre.

Manurial experiments on sugar cane, 1912-1915, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 5, pp. 145-155, pls. 8).—This gives the results of an experiment to determine the value of different forms of nitrogen used on plant and first ratoon canes and continues the work noted above.

The greatest profit from first rattoons at the Brechin Castle estate was obtained from the plat receiving sulphate of ammonia and sulphate of potash, and the lowest return from the plat receiving nitrogen only in the form of sulphate of ammonia. The plat yielding the largest profit from the Esperanza estate was the one receiving sodium nitrate in connection with phosphoric acid and potash, while the least return was obtained from the plat receiving sulphate of ammonia and potash and that receiving sulphate of ammonia alone. The largest return from the Malgretoute estate was obtained by the use of calcium cyanamid with phosphoric acid and potash, and the smallest return from the plat receiving calcium nitrate with phosphoric acid and potash.

Proceedings of the Association of Official Seed Analysts of North America, 1914 (*Proc. Assoc. Off. Seed Anal. of No. Amer.*, 1914, pp. 32).—A brief résumé of the development and activities of the association is given, together with the following papers presented at the seventh annual meeting (E. S. R., 32, p. 200): The Necessity for Standardization of Methods, by E. Brown; Uniform Methods of Sampling Seed, by E. D. Eddy; Apparatus and Methods Employed in Making Purity Tests of Seeds, by F. H. Hillman; The Enforcement of the New Jersey Seed Law, by J. P. Helyar; The Weed Content of Seeds, by A. L. Stone, which includes a table giving the number of seeds borne by 29 annual, 17 perennial, and 8 biennial weeds; and The Weed Content in Some Commercial Seeds, by L. H. Pammel and Charlotte M. King.

A paper on The Germination of Seeds Buried Ten Years, by W. L. Goss, points out that of 112 varieties 21, including only 4 weeds, never produced any sprouts after being buried; 69 produced sprouts after 10 years' burial; and the remainder perished during the interval. Of the 69 living at the end of 10 years 28 germinated 51 per cent or better, 13 between 25 and 50 per cent, 13 between 10 and 24 per cent, and 17 below 10 per cent. Attention is further called to the fact that green foxtail germinated 79 per cent at the end of 10 years. Broad leaved or bitter dock germinated 89 per cent in 10 years, black nightshade 90 per cent, burdock 93 per cent, Jimson weed 95 per cent, ox-eye daisy 82 per cent, Canada thistle 21 per cent, and black mustard 25 per cent. The results of similar work by Duvel have been previously noted (E. S. R., 17, p. 556).

Results of seed inspection, 1914, J. P. HELYAR and R. SCHMIDT (*New Jersey Stas. Bul.* 279 (1915), pp. 3-35).—This bulletin tabulates the results of analysis of 448 unofficial samples and 455 official samples of seeds. The official samples included timothy, redtop, Kentucky and Canada blue grass, orchard grass, millet, meadow fescue, hard fescue, English rye grass, brome grass, red,

alsike, crimson, and white clover, alfalfa, and vetch. Comments are given on the official samples, and the methods of taking and sending samples to the seed laboratory are described. The text of the New Jersey seed law is included.

HORTICULTURE.

Subtropical vegetable gardening, P. H. Rolfs (*New York: The Macmillan Co., 1916, pp. XVIII+309, pls. 16*).—A practical treatise on vegetable growing in subtropical countries. Although the subject matter is based primarily on Florida practice, the author has also drawn on the results of horticultural investigators in this country as well as on the horticultural literature of tropical countries.

The first or general part of the work discusses soils and manures for vegetable gardening in warm countries, fertilizers, rotation of crops in vegetable gardening, water and watering, seeds and seed sowing, planting, pests and diseases, and marketing. The succeeding chapters take up the various classes of vegetables with reference to their specific cultural treatment. Short reference lists are given of publications dealing with the more important vegetables.

Vegetable culture, H. A. VAN HERMANN and R. S. CUNLIFFE (*Estac. Expt. Agron. Cuba Circ. 51 (1916), pp. 75, figs. 18*).—This circular discusses the general principles of vegetable growing, and gives specific directions for the culture of various kinds of vegetables adapted for culture in Cuba.

Cabbage, J. C. PRICE and G. V. STELZENMULLER (*Alabama Col. Sta. Bul. 187 (1916), pp. 3-20, figs. 2*).—This bulletin gives the results of fertilizer experiments and variety tests with cabbage conducted under the direction of the station, together with general directions for growing cabbage based upon the experiments, and including notes on insects and diseases.

Early peas tried at Wisley, 1915, C. C. TITCHMARSH (*Jour. Roy. Hort. Soc., 41 (1915), No. 2, pp. 277-289, pl. 1*).—A report on varieties of garden peas under observation at Wisley in 1915.

Factors affecting regular bearing in orchards, J. E. GOURLAY (*Agr. Student, 22 (1916), No. 7, pp. 465-470, fig. 1*).—This article summarizes the results of experiments at the New Hampshire Experiment Station in plait tests of fruit trees with fertilizers, cultivation, mulching, liming, and cover crops; and of the effect of girdling and pollination, previously noted (E. S. R., 33, p. 44).

Bridge grafting of fruit trees, W. F. FLETCHER (*U. S. Dept. Agr., Farmers' Bul. 710 (1916), pp. 8, figs. 7*).—In this publication the author discusses the range of usefulness of bridge grafting and gives detailed instructions for bridge grafting. Suggestions are also given for the prevention of injuries by mice, rabbits, and borers, together with a list of Department publications relating to animals and insects that are likely to girdle trees.

Pruning, W. H. CHANDLER and H. B. KNAPP (*Cornell Reading Courses, 5 (1916), No. 104, pp. 73-96, figs. 27*).—A popular treatise on the methods of pruning various fruit trees and bushes.

Apple and pear growing, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul. 92 (1915), pp. 74, pls. 2, figs. 49*).—A practical treatise on the establishment and management of apple and pear orchards, including descriptions of varieties. A section on insect pests of the apple and pear, by W. W. Froggett and W. B. Gurney (pp. 27-47), is also given.

Grass mulch culture of apple orchards, F. H. BALLOU (*Agr. Student, 22 (1916), No. 7, pp. 471-475, figs. 4*).—A popular summary of combined mulching and chemical fertilizer experiments in apple orchards being conducted at the Ohio Experiment Station.

As a result of these experiments it was found that by the judicious use of fertilizers on the thin orchard soils of the hilly sections of southeastern Ohio the vigor and fruitfulness of the trees is not only improved but the vegetation beneath the trees becomes transformed from a scanty wild growth of native weeds and poverty grass to an abundant growth of better grasses which, annually cut and allowed to remain as a soil covering, is rapidly proving a source of humus for the soil. No grass seed has been sown in any of these experiments.

The methods of propagation of the best varieties of perry pears, A. TRUELLE (*Les Modes de Propagation des Meilleures Variétés de Poiriers à Poiré Argentan: Emile Langlois*, 1915, pp. 11).—In addition to a discussion of methods of propagation, a list is given of some 84 varieties of cider pears of French and of foreign origin, together with a selected list of 15 of the more important varieties, which includes analytical data showing the principal elements contained in a liter of juice of these varieties.

Report on the cooperative fertilizer experiments with cranberries at Whitesbog, Browns Mills, New Jersey, 1915, F. P. SCHLATTER (*Proc. Amer. Cranberry Growers' Assoc.*, 46 (1916), pp. 9-13, 15-19).—A general summary is given of the results secured in 1915 in the cooperative fertilizer experiments with cranberries being conducted under the direction of the New Jersey Experiment Stations (E. S. R., 84, p. 150). The data secured from various plots are presented in tabular form and discussed.

Although no definite conclusions are drawn at this time, the results of the work for the three seasons show that fertilizers have given an increased yield in only one series of experiments, where the plots were located on a sandy soil. In one series, which is located on deep mud or muck bottom soil, fertilizers, excepting perhaps phosphorus-containing materials, have had a detrimental effect. Practically the same results were secured in a series of experiments conducted on a deep mud soil underlaid with bog iron ore.

The resistance of various gooseberry varieties against North American gooseberry mildew and their behavior on treatment with sulphur, G. Köck (*Die Widerstandsfähigkeit verschiedener Stachelbeersorten gegenüber nordamerikanischen Stachelbeermehltau und ihr Verhalten bei der Behandlung mit Schwefel*. Vienna: K. K. Pflanzenschutzstation [1914], pp. 4).—The author enumerates some 100 varieties of gooseberries under observation and gives further lists of those which were subject to mildew attack and those which suffer from leaf fall upon being treated with sulphur.

Strawberry culture, F. W. JIMENEZ (*El Cultivo de la Fresa*. Mexico: Govt., 1914, rev. and enl., pp. 27).—A popular treatise on strawberry culture with special reference to Mexican conditions.

Note on some determinations on the grapes of French-American and American hybrid vines, F. C. TORNELLO (*Agr. Mod.* [Milan], 22 (1916), No. 3, pp. 26-28).—The author reports observations made on vines of six hybrid species, conducted in the antiphylloxera nursery at Cerignola. The data given show the yield of the different species, quality of the fruit, and relative proportion of the juice, must, and residue, as well as the sugar, acid, and alcoholic content of the must.

Muscadine grapes, G. C. HUSMANN and C. DEARING (*U. S. Dept. Agr., Farmers' Bul.* 709 (1916), pp. 28, figs. 29).—A treatise on the Muscadine grapes with reference to their botanical relation and classification, propagation, soils, planting, companion crops, cultivation, fertilization, pollination, pruning and training, harvesting and handling, yields and returns, uses, insect enemies and diseases, breeding investigations, and general descriptions of the leading varieties.

As a result of the breeding investigations already conducted by the Department some valuable seedlings have been secured. One lot of 49 seedlings has been produced in which over 50 per cent are perfect flowered and self-fertile, there being no sterile male seedling in this lot. The progress thus far made with this lot suggests that it is only a matter of time when self-fertile varieties with greater yields than the present varieties will be produced. A number of promising hybrids between Muscadine and American Euvitis and between Muscadine and Vinifera grapes have also been produced.

The raisin industry, G. C. HUSMANN (*U. S. Dept. Agr. Bul. 349 (1916)*, pp. 15, pls. 9, figs. 3).—An account of the raisin industry in the United States, in which consideration is given to the origin, growth, and fluctuations in the industry, soils adapted for raisins, preparation of soils, pruning methods, raisin varieties, climatic conditions, harvesting and preparing the crop, dipping and scalding raisins, packing raisins, and classes of raisins.

[Varieties of the avocado], F. O. POPENOE (*Cal. Citrogr., 1 (1915)*, No. 3, pp. 14, 33; *1 (1916)*, Nos. 4, pp. 12, 13, 24, figs. 3; 5, pp. 8-10, figs. 4).—An exposition on the varieties of the avocado, including a descriptive list of the varieties which was prepared for the California Avocado Association.

Study on the chayote (*Sechium edule*), D. A. HERRERA (*Bol. Dir. Gen. Agr. [Mexico]*, 5 (1915), No. 2, pp. 135-143).—In this article the author discusses the chayote with reference to its botany, chemical composition, culture, and uses.

Features of the grapefruit in California, A. D. SHAMEL (*Cal. Citrogr., 1 (1916)*, Nos. 5, pp. 19, 20, figs. 2; 6, pp. 3, 13, fig. 1).—A paper on this subject in which the author reviews the grapefruit situation in California. Information is given relative to varieties, distribution of plantings, relation of composition and other characteristics to the quality, comparative analyses of Florida and California grapefruit, and analyses of representative types of California-grown Marsh Seedless grapefruit during the ripe period.

The consumer's dollar working backwards, G. H. POWELL (*Ann. Conv. Nat. League Com. Merchants U. S.*, 24 (1916), pp. 80-91, figs. 5).—An economic discussion of the methods and cost of distributing citrus fruit, with special reference to the California citrus fruit crop.

Seed gardens (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 39 (1915)*, pp. 24, pls. 3).—This pamphlet contains the following articles: Report on a Study of the Tea Seed Gardens in Cachar and Sylhet, by A. S. Tunstall, translated by C. Bernard (pp. 1-14), and Some Observations on Tea Gardens in Java, by C. Bernard (pp. 15-24). These articles contain information relative to the care and management of the tea seed gardens with special reference to the pruning and training of seed trees and insect pests and diseases and their control.

Fertilizer experiments at Malabar, II, K. A. R. BOSSCHA (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 37 (1915)*, pp. 18).—A further report on fertilized experiments with tea plants conducted at Malabar (E. S. R., 32, p. 46). A brief note on the productive possibilities of the tea plant, by A. E. Reijnst (pp. 11-13), is also included.

The production and commerce of nuts in Asia, M. and L. RIGOTARD (*Vie Agr. et Rurale*, 6 (1916), No. 10, pp. 175-178, figs. 2).—This article is essentially a comparative study of French and Asiatic varieties of walnuts with special reference to their commercial importance.

Experiments in forcing the lily-of-the-valley by means of the warm water process, G. A. LANGER (*Möller's Deut. Gärt. Ztg.*, 30 (1915), No. 50, pp. 398-401, figs. 7).—In 1914 experiments were conducted with a large number of lily-of-the-valley plants which were treated by the warm bath process (E. S. R.,

27, p. 842), the various temperatures ranging from 25 to 45° C. (77 to 113° F.), and for 5- and 10-hour periods. The warm water bath was applied to some lots of plants as early as November 25 and to others as late as February 22.

Summing up the data secured from the various tests, the author finds that the advantage of the warm water process for early forcing has been proved beyond doubt. The temperature of the water and the duration of the bath varies with the time the plants are to be forced. For early forcing the temperature should range from 35 to 38° and the bath should be continued for a 10-hour period, or with a temperature of 40° an immersion period of only 4 or 5 hours is necessary. Later in the season the temperature may be reduced from 32 to 35° and the immersion period continued for about 5 hours. In the present experiments the warm water bath applied after the middle of February appeared to be not only superfluous but to do some damage.

Generally speaking, it is not necessary to immerse the plants for as long a time after a wet or cold summer as after a dry and warm summer. Plants from heavy soils are more susceptible to treatment than plants from light sandy soils, and large plants react more favorably than small plants. In all cases it is necessary to maintain the water at the proper temperature throughout the time of the bath.

[*Phloxes and pyrethrums at Wisley, 1915*], C. C. TITCHMARSH (*Jour. Roy. Hort. Soc.*, 41 (1915), No. 2, pp. 250-276).—This comprises a report on several hundred varieties of phlox and pyrethrums under observation at the Wisley Gardens during 1915.

House and window plants, D. Bous (*Les Plantes d'Appartement et les Plantes de Fenêtres*. Paris: J. B. Bailliére & Sons, 1916, 2. cd., rev. and enl., pp. 443, figs. 219).—Part 1 of this work deals with the general principles of culture as applied to house and window plants. Part 2 contains a descriptive list of plants suitable for windows and balconies, including specific cultural directions, and part 3 takes up in a similar manner the plants suitable for culture in the house. Part 4 contains classified lists of the plants, with special reference to their light requirements and value for foliage, flowers, and decorative purposes.

Fertilizing lawn and garden soils, P. E. BROWN (*Iowa Sta. Circ.* 24 (1916), pp. 3-15).—This circular discusses the preparation of lawn soils, fertilization, seeding, subsequent fertilization, and renovating lawns. Information is also given relative to the use of fertilizers and green manure crops for the vegetable garden.

The North Dakota farmstead, its arrangement and adornment, H. O. WERNER (*North Dakota Sta. Circ.* 10 (1916), pp. 62, figs. 51).—In this circular the author discusses the location of the farmstead site and the arrangement of farm buildings and grounds, together with the development of the farmstead from an ornamental point of view. A descriptive list is given of trees, shrubs, vines, hardy perennials, and annual plants suited for North Dakota conditions, together with detail plans of farmsteads with lists of plant materials suggested. Directions are also given for the culture and care of trees and shrubs.

Gardeners' and florists' annual for 1916, edited by J. H. DICK (New York: A. T. De La Mare Printing & Publishing Co., Ltd., 1916, pp. 231, figs. 21).—This work contains a digest of the events of the horticultural year in this country and abroad, including the activities of the national societies, a summary of law cases affecting the trade, biographies of leading horticulturists, special articles, and miscellaneous notes and information dealing with gardening and floriculture.

FORESTRY.

Laws, decisions, and opinions applicable to the National Forests, compiled by R. F. FEAGANS (*U. S. Dept. Agr., Office Solicitor, Laws, Decisions, and Opinions Applicable to the National Forests, 1916, pp. 151*).—This comprises a compilation of laws and parts of laws of a general nature affecting the administration and protection of the National Forests, with citations to acts of special or local application, and references to the more important decisions of the courts, the Interior Department, the Attorney General, the Comptroller of the Treasury, and the Solicitor of the Department of Agriculture.

Seventh annual report of the state forester.—Forestry in Vermont, A. F. HAWES (*Ann. Rpt. State Forester Vt., 7 (1915), pp. 55, pls. 6*).—This report includes a description of some of the more interesting examples of forestry throughout the State, together with an account of nursery planting operations for the year and activities on the different State forests. A brief note is given on white pine blister rust inspection for 1915. A report on forest fires in 1914 by R. M. Ross and a report on an examination made by B. A. Chandler on land willed to the United States Government are also included.

Eighth annual report of the Washington Forest Fire Association, 1915 (*Ann. Rpt. Wash. Forest Fire Assoc., 8 (1915), pp. 20*).—A report of the activities of the association for the year 1915 in the protection of some 2,586,400 acres of forests from fire.

Report of committee on forestry, Hawaiian Sugar Planters' Association, for the year ended September 30, 1915, L. A. THURSTON (*Honolulu: Hawaiian Gazette Co., Ltd., 1915, pp. 22*).—This report contains short reports by C. S. Judd (pp. 6-14), D. Forbes (pp. 15-20), and L. von Tempsky (pp. 21, 22), in which consideration is given to the desirability of forest protection and forest extension for the conservation of water and the protection of watersheds, the prevention of sand or dust drifting, and the production of the major and minor forest products. Lists are given of trees suitable for these various purposes in Hawaii.

The Eberswalde forest-seed testing station and the methods of testing the seeds, SCHWAPPACH (*Ztschr. Forst u. Jagdw., 47 (1915), No. 11, pp. 631-651, fig. 1*).—A descriptive account of the seed-testing work of the Eberswalde seed-testing station.

Progress report of forest administration in Baluchistan for 1914-15, MULAJ (*Rpt. Forest Admin. Baluchistan, 1914-15, pp. 6+11+28*).—The usual progress report of the administration of the state forests of Baluchistan, including data relative to alterations in areas, forest surveys, working plans, forest protection, revenues and expenditures, etc., for the year 1914-15.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1914-15, H. H. HAINES (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1914-15, pp. II+52+5*).—A report similar to the above relative to the administration of the state forests of the Province of Bihar and Orissa for the year 1914-15.

Annual administration report of the forest department of the Madras Presidency for the twelve months ended June 30, 1915, A. W. LUSHINGTON, S. COX, P. M. LUSHINGTON, C. D. McCARTHY, ET AL. (*Ann. Admin. Rpt. Forest Dept. Madras, 1915, pp. 81+LXXXII+18*).—This comprises separate reports on the administration of the state forests in the Northern, Central, Southern, and Western Circles of the Madras Presidency, together with a summarized report on the administration of the forests in the Presidency as a whole. Data relative to alterations in forest areas, forest surveys, protective and miscellaneous

work, yields in major and minor forest products, revenues, expenditures, etc., are included in tabular form.

Progress report on forest administration in the Northwest Frontier Province for the year 1914-15, W. MAYES (*Rpt. Forest Admin. Northwest Frontier Prov., 1914-15, pp. 4+II+14+XXIV*).—A report similar to the above relative to the administration of the state forests of the Northwest Frontier Province for the year 1914-15.

Report of the department of forestry for the year ended June 30, 1915, R. DALEYMPLE-HAY (*Rpt. Forestry Dept. N. S. Wales, 1915, pp. 6, pls. 6*).—This is the usual progress report relative to the administration and management of the state forests and forest nurseries of New South Wales, including information relative to afforestation work, alterations in forest areas, imports and exports of timber, revenues, expenditures, etc.

The native and cultivated forest trees and shrubs of the Missouri River basin, L. H. PAMMEL, G. B. MACDONALD, and H. B. CLARK (*Proc. Iowa Acad. Sci., 22 (1915), pp. 23-56, pls. 12*).—In this paper the authors present a catalogue of trees and shrubs of the Missouri River basin in western Iowa and eastern Nebraska. Introductory considerations deal with the topography and soils of the region, the range and ecological distribution of trees in the area surveyed, and the origin of the tree flora.

A mill scale study of western yellow pine, H. E. MCKENZIE (*Cal. Bd. Forestry Bul. 6 (1915), pp. 171, figs. 222*).—The study here reported is based upon 919 trees ranging from 20 to 44 in. in diameter breast-high. A complete analysis of the quality and quantity of lumber produced from these trees, also from the butt logs (the best part) and the top logs (the poorest part of the trees) was made. The measurements secured in this work are here presented, together with deductions made therefrom, in a series of curves and tables with a view to throwing some light on the lumbering value and the best time to cut trees of various sizes.

Colonial plants.—Latex and resin yielding plants, H. JUMELLE (*Les Cultures Coloniales.—Plantes à Latex et à Résines*. Paris: J. B. Bailliére & Sons, 2. rev. ed., vol. 7, 1915, pp. 119, figs. 41).—This is part 7 of the author's revised work (see p. 829). The present part discusses various rubber and resin yielding plants with reference to their botany, exploitation, culture, and utilization.

[Papers on rubber culture and the rubber industry] (*Introductory Papers Internat. Rubber Cong. Batavia, 1914, pp. [191], fig. 1*).—This comprises some 21 papers on various phases of rubber culture and the rubber industry, which were prepared for the International Rubber Congress and Exhibition at Batavia in September, 1914. Certain of the present papers are classed as introductory papers and others as papers prepared for but not included in the rubber book issued by the congress (E. S. R., 33, p. 50).

Manurial experiments with young rubber at Kuala Lumpur, F. G. SPRING (*Agr. Bul. Fed. Malay States, 4 (1916), No. 4, pp. 105-110*).—Data are given on the fourth season's results with various combinations of lime, nitrogen, phosphorus, and potash (E. S. R., 32, p. 339).

The fertilizers in this experiment were applied at the beginning of the first and third years. They appeared to have had a stimulating effect as regards growth for about a year after each application. After this there seemed to be a slight reaction as compared with the control plats. Over the whole 4-year period the total increase in the manured plats in every case exceeded that of the controls. No definite conclusions are to be drawn until the trees are tapped.

The natural reproduction of sal. R. S. TROUP (*Indian Forester*, 42 (1916), No. 2, pp. 57-60).—Experiments conducted by the author show that in the open, exposed to the sun, the seed of sal (*Shorea robusta*) falling on a layer of dead leaves fails to germinate or, if it does germinate, perishes rapidly. Under shade with complete protection from the sun the seed falling on layer of dead leaves germinates and the seedlings develop satisfactorily above ground during the first rainy season. Relative to the root system, however, unless the leaf layer is so scanty as to permit of the ready penetration of the taproot to the mineral soil, the roots spread horizontally along the moist leaves and perish in the ensuing dry season. These results suggest that the annual layer of fresh dead leaves may be a highly adverse factor so far as natural reproduction is concerned.

Anatomical investigations on the formation of annual rings of *Tectona grandis*. F. GEIGER (*Jahrb. Wiss. Bot. [Pringsheim]*, 55 (1915), No. 4, pp. 521-607, figs. 28).—A study of annual ring formation of teak woods secured from different sections of east and west Java. Data are given and discussed showing the variation in the formation and distribution of the elementary organs in the different specimens, with special reference to structure in the region of growth.

A bibliography of related literature is appended.

Reproduction of teak by root suckers. E. MARSDEN (*Indian Forester*, 42 (1916), No. 2, pp. 43-50, pls. 6).—Experiments reported by the author indicate that the so-called root suckers of teak are really "stool shoots" and that true root suckers are comparatively rare, these being usually confined to a few shoots which originate near the head of the roots, close to the parent stem.

Teak working plans in Burma. H. W. A. WATSON (*Indian Forester*, 42 (1916), No. 1, pp. 4-17).—In this article the author discusses the past working plans and the probable trend of future working plans, including suggestions for their development.

An investigation relative to the most exact method of measuring teak trees and teak stands. H. BEEKMAN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Boschic.*, No. 1 (1915), pp. VIII+93, pls. 29).—This comprises a report on a comparative study of methods of estimating age, diameter, height, and volume growth, with special reference to teak trees and teak forests. The data secured are presented in a series of diagrams and tables and fully discussed.

The care and improvement of the woodlot. C. R. TILLOTSON (U. S. Dept. Agr. Farmers' Bul. 711 (1916), pp. 24, figs. 6).—This bulletin discusses the essentials of a good woodlot and its improvement, care, and methods of regeneration.

Marketing of woodlot products in Kentucky. W. D. STERRETT (*Bien. Rpt. State Forester Ky.*, 2 (1915), pp. 71-149, pls. 24).—In this paper the author briefly surveys the woodlot situation in Kentucky; gives an account of the woodlot regions, wood-using industries, and how the different species are used; and discusses the methods of increasing the profits from woodlot sales and of preventing the deterioration of cut woodlot products. A directory of wood-using firms is included.

Utilization of southern wood waste. A. D. LITTLE (*Chem. Engin.*, 23 (1916), No. 2, pp. 83-86).—An address on this subject delivered before the eighth annual meeting of the American Institute of Chemical Engineers in January, 1916, in which the author gives special attention to the various methods of utilizing wood waste in longleaf yellow pine.

Wood flour. F. W. KRESSMANN (*Metallurg. and Chem. Engin.*, 14 (1916), No. 7, pp. 372-374).—A discussion of the nature, properties, and uses of wood flour.

DISEASES OF PLANTS.

The International Phytopathological Convention of Rome and its relation to tropical agriculture, A. G. L. ROGERS (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), pp. 109-117).—A brief abstract is given of this paper, which dealt with the history of the movement in favor of international action for control of plant diseases, the congress at Rome in 1914, the inadequate representation of tropical countries, a summary of legislation and regulations at present in force in tropical and subtropical countries, a comparison of these regulations with those contemplated by the Rome convention, and the advantages and disadvantages of the proposed change of method. The discussion which followed the paper is also reported.

Vegetable pathology, D. Bois (*Rev. Hort. [Paris]*, 87 (1915), No. 19, pp. 404, 405).—The author describes briefly the organization of the Société de Pathologie Végétale, which held its first meeting in Paris in February, 1914, listing the officials chosen thereby and noting the main contents of its first bulletin.

[Effect of meteorological conditions on development of plant diseases], G. DOROGIN (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 3-9, fig. 1).—It is announced by the author that hereafter the Bureau of Mycology and Phytopathology of the Russian Department of Agriculture will make a special study of the meteorological conditions of the Petrograd region in their relation to the development of plant diseases. In order to secure accurate data this study will extend over a period of many years. Tables showing cloudiness, rainfall, depth of snow layer, soil and atmospheric temperature, atmospheric pressure, reiteration and strength of winds, and certain other factors will be compiled quarterly and published in this journal. The first table, covering the winter months of 1914-15, is given with this article.

The genus *Fusarium* in plant pathology, G. GANDARA (*Mem. y Rev. Soc. Cient. "Antonio Alzate,"* 32 (1913), No. 9-10, pp. 415-426).—The author gives the results of an examination attempting to determine the really pathological species of *Fusarium* so far as plants are concerned, the known synonymy of the same, and the hosts attacked by preference in each case.

An Asiatic species of *Gymnosporangium* established in Oregon, H. S. JACKSON (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 22, pp. 1003-1010, pls. 2).—A detailed account is given of investigations conducted by the author, while connected with the Oregon Experiment Station, on *G. koreense*, a preliminary note of which has already been given (E. S. R., 34, p. 352).

Pyrenopeziza elodeae n. sp., V. ORSHANSKAIÀ (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 35-37, figs. 2).—The above species was isolated by the author from *Elodea densa*, the leaves and stems of which were affected by this parasite and turned yellowish instead of normal bright green. The host tissue was found to be permeated with the fungus mycelium, which was also growing in flakes on the surface of the plant. A technical description of the fungus is given.

Rhizoctonia crocorum and *R. solani* (*Corticium vagum*), with notes on other species, B. M. DUGGAR (*Ann. Missouri Bot. Gard.*, 2 (1915), No. 3, pp. 403-458, figs. 9).—The author presents an account of investigations on *Rhizoctonia* as a cause of disease in plants, especially of those carried out since the appearance of his own earlier work with Stewart (E. S. R., 13, p. 55).

The view that the *Rhizoctonia* forms on crocus, alfalfa, and some other hosts belong to a single morphological species is confirmed. The correct name of the violet root fungus, so long as a spore stage remains uncertain, is held to be *R. crocorum*. This is known in a few localities in America and widely in

Europe. It attacks plants in many families, but mainly dicotyledons. Large sclerotia are observable in connection with crocus and alfalfa. The existence of distinct forms or races of this species requires further investigation. The organism has not yet proved to be culturable by the usual laboratory methods, and the evidence collected is still insufficient to identify the perfect form.

R. solani, which is readily distinguishable from the above, is said to be widely distributed in America and elsewhere on potato. The other host plants represent many families, *Asparagus sprengeri* being the only monocotyledonous host yet reported. The types of disease caused by this species are very diverse, damping off and root and stem rots being the most important direct effects. The organism is readily culturable by the usual laboratory methods. The perfect stage is thought to be *C. vagum*.

Contrasted descriptions are given of these two fungi, with notes on other species, some of which are considered as having insufficient affinities to be included in the genus *Rhizoctonia*.

A bibliography is appended.

Notes on plant parasitic nematodes, L. P. BYARS (*Abstr. in Science, n. ser.*, 43 (1916), No. 1102, p. 219).—Attention is called to the general characteristics of nematodes and to the economic importance and present distribution of the bulb and stem infesting nematode, *Tylenchus dipsaci*; *T. tritici*, a parasite of wheat kernels; *Aphelenchus armerodis*, a violet bud organism; and *Heterodera radicicola*, a gall-forming nematode on a number of plants.

[Plant diseases in Barbados], J. S. DASH (*Rpt. Dept. Agr. Barbados, 1913-14*, pp. 43-45).—It is stated that *Colletotrichum falcatum*, the cause of sugar cane red rot, was rarely met with during 1913-14, but *Marasmius sacchari*, the cause of a root disease of cane, appeared as usual. *Thielaviopsis ethaceticus*, which attacks cane cuttings principally, was severe in several places. It can be controlled, it is said, by passing the cuttings through Bordeaux mixture just before planting.

A banana disease may be connected with the presence of a *Fusarium* and a *Gleosporium* on the diseased portions. Insufficient nutrition and inferior living conditions generally may render the trees susceptible to these fungi.

Specimens of diseased tomato showed two diseases, one a leaf mold (*Cladosporium fulvum*), the other a fruit anthracnose due to a *Gleosporium*.

Grape mildew (*Oidium tuckeri*, *Uncinula spiralis*) was successfully treated with flowers of sulphur and lime in the form of a powder.

A dieback of cassava, ascribed to a *Gleosporium* (possibly *G. manihoti*), may be controlled, it is thought, by care in the selection of cuttings and soaking them in Bordeaux mixture just before planting.

Eurypha erumpens is said to have caused a loss of *Ficus nitida*.

Cultivated snapdragon (*Antirrhinum* sp.) showed evidences of a disease of the roots and of the stem near the ground, from the fructifications of which a *Colletotrichum* could be developed. This is said to be somewhat different from *C. antirrhini* described by Stewart (E. S. R., 12, p. 1055) as causing anthracnose of snapdragon. Use of seed for propagation is advised.

[Plant pests and diseases in Grenada], J. C. MOORE (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1914-15*, pp. 7, 8, 19).—A report of Ballou and Nowell, besides giving information regarding animal pests, records the discovery of root diseases due to three species of *Rosellinia*. Two of these were found attacking cacao, one in wet, the other in drier situations. The third form, *R. bunodes*, was observed on hibiscus in the interior of the island.

In another part of the report, brief notes are given on thread blight of cacao and nutmegs, also canker, pod brown rot, and dieback of cacao.

[Work of the Bureau of Mycology and Phytopathology], A. IACHEVSKII [JACZEWSKI] (*Istat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 48-52).—This is a general outline of the main problems on which the members of the bureau staff are working at the present time.

Of particular interest is a peculiar disease of cereals known in Russia as "drunk bread." This is attributed to the action of certain fungi, and results in general intoxication of the population when affected grains are used for food. The disease occurs from year to year in eastern Siberia and also occasionally in northern and central European Russia. Pathological as well as chemical investigations are under way, and preliminary reports are already in print.

Rusts are considered another serious pest of cereals. Work along this line is concentrated chiefly on selecting and breeding disease resistant varieties. Results of the previous two seasons' work will soon be published.

In regard to smuts, attention is directed toward simplifying and improving various methods of seed treatment. Contrary to the opinion of some practical men, the exposure of smut spores to a temperature of from 20 to 24° C. for a long time did not affect their ability to germinate.

Club root of cabbage is said to cause immense losses, especially in suburban gardens of Petrograd. A thorough study was made during the past three years on the life history of the causal organisms, means of infection, host relations, and means of control.

Much attention has been devoted to testing various fungicides, and the results of the experiments are fully in favor of lime and sulphur compounds as substitutes for Bordeaux mixture and other mixtures of copper salts. Root gall of nursery stock, American gooseberry mildew, and fungus diseases of insects are the remaining three problems mentioned in the outline.

An investigation of the mycological flora in Astrakhan, S. SHEMBELL (*Istat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, pp. 7-41, figs. 23).—The author gives an account of fungus diseases observed during the summer of 1913 in the Province of Astrakhan, Russia, chiefly in the vicinity of the city of Astrakhan.

The number of cryptogamic parasites in that particular season was not very great, but the area affected and the degree of infestation were quite serious. Most prevalent appeared to be members of the family Erysiphaceae, frequently attacked by a parasite of the genus *Cicinnobolus*, and various rust fungi. Among the latter is mentioned *Uromyces alhagini* n. sp. on leaves and stems of *Alhagi camelorum*. On the same host the author found also an undescribed species of *Septoria* which he named *S. alhagini*, and another new fungus on *Euphorbia esula* named *Leptothyrium caspicum* n. sp.

Grapes suffered more than any other cultivated plant, due to a severe attack of mildew (*Plasmopara viticola*), from 50 to 70 per cent of the fruit being affected. Spraying with Bordeaux mixture before the blossoming period gave almost perfect control of this disease, while omission of this spray resulted in the loss of the largest part of the crop. Two applications of Lazurin (a prepared Bordeaux mixture) on May 23 and July 3 at the rate of about 4½ lbs. to 21½ gal. water, with the addition of the dusting of the blossoms with sulphur, practically freed the plants from the fungus. In the same experiment, poly-sulphids and insecticides alone did not check the development of the disease.

[Report of the plant pathologist], I. E. BARRARIN (*Otchet Mikol. Kab. Salgirsk. Opytn. Plod. Sta.*, 1913-14, pp. 14).—A brief account is given of the work carried on at the Salgir Experiment Station since its organization in 1913. The diseases studied included a supposedly nonparasitic spot of apple fruit known in Germany as Stippigkeit; the so-called dry spot of apple leaves; pink

spot of watermelons due to *Glaeosporium lagenarium*, which is very widely spread in the Crimea; and wheat rust caused by *Puccinia glumarum*, with particular reference to the possibility of its transmission with the seed.

In testing various fungicides, it was found that a proprietary compound known as Mortus was most effective against apple scab and American gooseberry mildew (*Sphaerotheca mors-uvae*). The composition of Mortus is unknown, but chemical analysis showed the presence of sodium and arsenic, and some evidence was obtained that the effectiveness of the compound is due to the latter element. Laboratory tests with germinating spores of *Monilia fructigena*, *S. humuli*, *Trichothecium roseum*, *Penicillium* sp., and others showed that germination was retarded in a solution of $\frac{1}{2}$ gm. sodium arsenite in 3 liters of water, and that it ceased entirely in a solution of twice this strength. More extended experiments are to be carried on in the future.

Observations on parasitic fungi in the Province of Podolsk, M. E. DOBROVOL'SKII (*Zhur. Bol'zenni Rast.*, No. 4-5 (1914), p. 139; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, pp. 74, 75).—Among the fungi collected by the author in the Province of Podolsk in 1912, some are reported on new hosts, among which are *Tilletia controversa* on *Triticum vulgare*, *Venturia inaequalis* on *Pyrus prunifolia*, and *Rhytisma punctatum* on *Acer ginnale*. The author also describes *Ascochyta cardiae* n. sp. from *Leonurus cardiaca*.

[Report on plant diseases], F. A. STOCKDALE (*In Summary of Investigations Made During the Period January 1 to June 30, 1915. Manritius: Dept. Agr.*, 1915, pp. 1, 2).—Three manifestations are described from different localities of what appears to be a physiological disease resulting in the production of a gummy substance in the tissues of the sugar cane plant. The leaf and stem disease of cassava due to *Glaeosporium manihotis* has again been prevalent in some sections, local varieties suffering more than those recently introduced. The local variety of pistachio appears to be more resistant than imported ones to a leaf spotting disease caused by a species of *Cercospora*.

Phytophthora infestans was common on potatoes and tomatoes in some localities late in June. Its control, where dews are heavy, appears to be more difficult in this region than in Europe. Attempts are being made to hybridize locally resistant varieties with standard European varieties of tomatoes.

Duration of resistance of plants and insects to hot water (*Rev. Sci. [Paris]*, 53 (1915), I-II, No. 17, pp. 403, 406).—In connection with the mention of tests on the resistance of insects to hot water in view of the present high price of chemicals, it is said to have been found by Gaston and Vermorel that grapevines were uninjured by a hot water temperature of 45° C. (113° F.), but that young leaves were killed by a temperature of 50° in 6 minutes and 52° in 1 minute.

Burgundy mixture as a substitute for Bordeaux mixture. W. NOWELL (*Agr. News [Barbados]*, 14 (1915), No. 355, p. 398).—The difficulty experienced in securing quicklime for Bordeaux mixture in some of the West Indies having resulted in the employment of slaked or partly slaked lime in this application and in the preparation therefrom of an inferior spray for fungicidal purposes, attention has been directed to Burgundy mixture. This is said to have yielded excellent results in experiments referred to, showing advantages even where good lime is available. Several formulas are given, with directions for mixing and testing.

Fungicide experiments, 1914, G. P. DARRELL-SMITH (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 6, pp. 494, 495).—The results of these and previous experiments are claimed to show that the safest treatment thus far tested, as regards germinability and freedom from bunt, is immersion of the seed wheat for three minutes in 1.5 per cent copper sulphate solution and then for an equal period in lime water.

[*Potassium permanganate treatment for seed grains*], K. L. ÉGERT (*Selsk. Khoz.*, 1914, pp. 1343-1346; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 66).—The author obtained a perfect control of wheat smut by soaking seed $\frac{1}{2}$ hour in potassium permanganate solution at the rate of about $\frac{1}{2}$ oz. to 3 gal. of water. A solution practically 10 times stronger than this did not affect the germinating power of the grain. This treatment, according to the author, is less expensive than the usual formalin method, and, besides, the seed thus treated is not attractive to birds on account of a black color which it takes on in soaking.

Blight in maize (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 5, p. 388).—Reports sent in by officials are said to indicate that a leaf blight of maize, due to a *Helminthosporium*, causes severe loss in localities where heavy rainfall and hot steamy weather continue for some time. The trouble is apparently augmented by the continuous growing of maize on the same land year after year. Rotation and the use of leguminous crops for green manuring are recommended.

Flower-bud and boll shedding of cotton in the Ilorin Province, Nigeria, T. THORNTON (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), pp. 331-355).—This is an abstract of an account, with discussion, of observations made on both exotic and native cotton as regards one of the most serious drawbacks to its cultivation in that section.

High relative humidity, cloudy weather, and rain usually produced very severe losses. During the wet period the buds and bolls only were dropped, but not long after the establishment of the dry season an increased shedding of these was accompanied with a loss of leaves. Partial recovery later usually resulted in the production of new leaves and blooms, and a little rain falling in this period may result in a fair crop.

Helminthosporium turicum, I. ZHAYORONKOVA (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, pp. 42-50, figs. 7).—This is an account of studies upon the effects of various culture media and temperatures on the growth of this organism, which the author isolated from diseased maize leaves.

The cultures were started in Van Tieghem moist cells and then transferred to nutrient media. The best growth was obtained on grains of maize and rice, and especially on bread. Gelatin appeared to be completely liquefied after three weeks. In regard to the temperature, growth began one or two days earlier and the mycelium developed more luxuriantly and densely at 25 to 30° C. than at 15 to 16°.

Crown gall of mangels (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt. 1914, p. 31, pl. 1*).—Several specimens of roots showing crown gall due to *Bacterium tumefaciens* have been received from Warwickshire and Shropshire. The disease is said to be increasing in importance, as numerous kinds of plants are attacked, including beet, potato, hop, tobacco, apple, and most other fruit trees, roses, and chrysanthemums.

Wart disease, G. T. MALTHOUSE (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt. 1914, pp. 27-29, pl. 1*).—A report is given of the 1914 potato tests for resistance to *Synchytrium endobioticum*, 11 varieties and 2 seedlings not previously tested being listed as immune thereto.

It is stated that since the first variety tests were commenced in 1909, 360 varieties and seedlings have been tested. Of these, 90 were of continental or South American origin and 31 have proved to be immune, while of the 270 of British or North American origin only 63 have proved to be immune. About 23 varieties are listed which are considered to be the most desirable and readily obtainable.

Tests with formalin showed no perceptible difference in degree of attack.

Further examination of material previously studied has shown that the resting stage of *S. endobioticum* is not of common occurrence.

Beet tumors. J. PEKLO (*Ztschr. Zuckerindus. Böhmen*, 39 (1915), No. 5, pp. 204-219, figs. 5).—The author describes the tumors resulting from the inoculation of sugar beet with *Bacterium beticum*, obtained for this purpose from Smith after his discovery of this organism (E. S. R., 25, p. 243). *B. tumefaciens* was also used to inoculate various plants. The results, such as tumor formation, infection strands in stems, etc., are discussed, with emphasis on the similarities between the results as shown in beets, for example, and those in animals and human beings.

Relation of stomatal movement to infection by Cercospora beticola. VENUS W. POOR and M. B. MCKAY (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 22, pp. 1011-1038, pls. 2, figs. 6).—The results are given of a study of leaf infection of the sugar beet caused by *C. beticola*.

Infection was found to be determined by certain morphological and environmental factors which influence stomatal activity. Among the factors concerned in the movement of stomata are leaf maturity, light, temperature, and relative humidity. Infection, both artificial and natural, was found to occur best on mature leaves and to be influenced by the rapidity of germ tube growth, maturity of leaves, and stomatal movement. Penetration of the leaf by the conidial germ tubes of *C. beticola* has been observed to occur only through open stomata, and consequently it is thought that infection probably takes place during daylight hours. As soon as penetration of the germ tube occurs, an attempt is made by the leaf cells to isolate the invading organism, but when this is not possible the fungus grows and produces a well-defined leaf spot.

A fungus of uncertain systematic position occurring on wheat and rye. P. J. O'GARA (*Science*, n. ser., 43 (1916), No. 1099, pp. 111, 112).—A report is given of a fungus which is found attacking the heads of wheat and rye some time before they emerge from the leaf sheaths. Often the heads are said to be so severely attacked that they do not emerge but remain permanently within the sheath. The organism has been isolated and grown in pure cultures, but its identification has not been fully determined.

Fungus diseases of wheat. G. P. DARNELL-SMITH and E. MACKINNON (*Dept. Agr. N. S. Wales, Farmers' Bul.* 102 (1915), pp. 3-31, figs. 28).—This consists of information and suggestions regarding control, as condensed from various sources, relating to fungus diseases of wheat in New South Wales. These include bunt or stinking smut (*Tilletia tritici* or *T. levis*), loose smut (*Ustilago tritici*), flag smut (*Urocystis tritici*), rusts (*Puccinia graminis* and *P. tritici*), mildew (*Erysiphe graminis*), take-all (*Ophiobolus graminis*), ergot (*Claviceps purpurea*), and blight associated with several species of *Septoria*. A form of contortion described is attributed to insect attack or to disproportionate growth in two different directions.

Seeding time and attack by stinking smut. J. APPL. (*Ztschr. Landw. Versuchsw. Österr.*, 18 (1915), No. 3, pp. 45-54).—Results are given of studies on the influence of fungicidal treatments of seed wheat on subsequent attack by stinking smut, and also on the effects of seeding time and weather in this connection.

It is stated that the germination of wheat seed at the temperatures prevalent during the early part of October results in a higher percentage of attack by stinking smut than does that of seed planted earlier. By planting after October 30, however, the percentage of attack was diminished, owing probably to the fact that the fungus germinates at a somewhat higher minimum temperature than the seed, thus permitting the cereal to pass its period of greatest susceptibility comparatively free from attack.

It is thought probable, however, that soil moisture is a more important factor in attack by stinking smut than is the temperature during the germination of the seed.

A Phoma disease of western wheat grass, P. J. O'GARA (*Science, n. ser.*, 43 (1916), No. 1099, pp. 110, 111).—A preliminary account is given of a Phoma disease of *Agropyron smithii*, a more extended account of which is promised for a later publication.

Gummosis, or the gumming of fruit trees, G. P. DARNELL-SMITH and E. MACKINNON (*Agr. Gaz. N. S. Wales*, 26 (1915), No. 5, pp. 405-410).—The authors give a brief historical survey, with notes on reports by several investigators, dealing more particularly with that of Butler (E. S. R., 24, p. 746).

While various causes and remedies are discussed, the general conclusion is reached that the one great measure, at once remedial and preventive in this connection, is proper attention to drainage.

[*Venturia inaequalis* and *V. pirina* in pure cultures], S. P. NOVOUSPENSKI^{II} (*Zhur. Botân. Rast.*, No. 4-5 (1914), p. 139; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 61).—The author briefly states that the apple scab fungus and the pear scab fungus are readily distinguishable in pure cultures by the color of their mycelium and the character of their growth. He also reports his observations on the development of apple scab in storage, the incubation period being only five days.

[*Fuscieladium pirinum* in pure cultures], G. FACHEWSKI^{II} (*JACZEWSKI*) (*Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, pp. 57-60, figs. 3).—Growth of the pear scab fungus (*F. pirinum*) in the author's studies appeared to be normal on gelatin as well as on cooked potato, carrot, and pear, but somewhat retarded on apple. Involution forms such as were reported by Novouspenski^{II} (see above) in case of the apple scab fungus were not observed in the cultures of *F. pirinum*.

[On the etiology of Stippigkeit], I. L. SERBINOV (*Zhur. Botân. Rast.*, No. 2-3 (1914), p. 51; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 1, p. 75).—Large losses are said to be sustained every year by Russian apple growers through a physiological fruit spot called in Germany Stippigkeit. Certain experiments conducted by the author have led him to think that this disease is due to intensive culture.

[White and brown fruit spot of pear], I. L. SERBINOV (*Zhur. Botân. Rast.*, No. 4-5 (1914), p. 123; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 61).—Two leaf spot fungi commonly appearing on pear leaves, *Septoria piri-cola* and *Entomosporium maculatum*, have been reported by the author as attacking the fruit also.

Experiments on American gooseberry mildew in Cambridgeshire, F. T. BROOKS, F. R. PETHERBRIDGE and G. T. SPINKS (*Jour. Bôl. Agr.* [London], 22 (1915), No. 3, pp. 227-230).—The purpose of these experiments, which were made in 1913-14, was to see if some form of spraying or soil treatment carried out on a commercial basis could replace the present system of pruning. In 1914 the summer stage of the fungus was particularly prevalent and widespread, so that the experiments were carried out under severe conditions. The treatment was probably more carefully done than would often be the case in commercial enterprises.

Spraying twice in the early part of the spring with lime sulphur or Bordeaux mixture, while somewhat helpful, was not profitable. Soil treatment and winter spraying also proved to be ineffective. Heavy use of farmyard manure favored the disease by causing abundant succulent growth. Pruning is deemed the only practical means of checking the disease. This is best carried out in

autumn, as soon as danger of renewed growth is past, usually early in September. Since perithecia form on the berries as early as May, it is important to destroy all diseased fruit as soon as possible.

Studies in the physiology of parasitism.—I, The action of *Botrytis cinerea*, W. BROWN (Ann. Bot. [London], 29 (1915), No. 115, pp. 313-348).—This contribution, the first of a series of studies now being carried out, is intended to lead the way to a fuller understanding of the more highly specialized parasites.

A method of preparing quickly and in practicable quantities a very powerful extract from the germ tubes of *B. cinerea* is described in some detail, as possibly applicable to other studies along similar lines.

It is stated that the extract shows two types of action on a plant cell, one on the cell wall leading to disintegration of the tissue, another on the protoplast producing death at late stage of the former process. The extract may be deactivated by heating, mechanical agitation, or neutralization with alkali.

It is thought that neither oxalic acid nor oxalates have any share in producing the toxicity of the extract, and that any lethal substance present must be of a colloidal nature. The only active substance in the extract appears to be the enzym, which produces a macerating effect mainly by solution of the middle lamella, and which causes also the lethal action of the extract. The death of the cells is brought about presumably by its action, either directly on the protoplasmic membrane or indirectly as a result of its action on the cell walls. The ability of certain tissues to resist the action of the extract is dependent upon the special properties of their cell walls.

PeroCID as a substitute for copper sulphate in combating *Peronospora* of grape stocks, F. GYOZDENOVIC (Ztschr. Landw. Versuchsw. Osterr., 18 (1915), No. 1-2, pp. 11-28).—This is an account and discussion of tests made with PeroCID, a proprietary preparation to be used in the form of spray, paste, or powder for the control of *Peronospora*, and a comparison of the fungicidal values of such preparations with those of sprays in common use.

The hibernation of the powdery mildew of the vine (*Uncinula necator*) in Hungary, J. INOS (Borászati Lapok, 46 (1914), Nos. 50, pp. 703, 704; 51, pp. 712, 713; 52, pp. 728, 729, figs. 8; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, p. 312).—The question as to how powdery mildew of grape passes the winter is said to be still unanswered. Istvánffy, in 1908, is said to have been the first to find the perithecia in Hungary.

The author observed considerable injury to grapes in the autumn of 1913. A large number of leaves examined in November showed perithecia on the mildew patches. The very abundant formation of these patches was thought to be due to the great variations in climatic conditions in that year, the summer being cool and wet and the autumn dry and warm.

A banana disease in Cuba, J. R. JOHNSTON (Estac. Expt. Agron. Cuba Circ. 47 (1915), pp. 1-9, pls. 7).—An account is given of the appearance, progress, and effects of a disease of banana in Cuba, which is stated to cause heavy losses in some districts and to threaten banana culture in this region.

The discoloration, wilting, and rotting of the parts is described, also the appearance of the stems in cross section, showing the relation thereto of the fungus, which is found in connection with the vascular bundles. The varieties which appear to be susceptible or resistant are indicated. The use of 0.2 per cent corrosive sublimate or other disinfectant is recommended, also removal of affected plants by cutting close to the ground and the application of quicklime to the stump.

Marasmus perniciosus n. sp., the cause of the krulloten disease of cacao in Surinam, G. STAHEL (Dept. Landb. Suriname Bul. 33 (1915), pp. 27+25+26,

pls. 12; abs. in Agr. News [Barbados], 14 (1915), No. 354, p. 382.—This contribution, which is given in Dutch, English (translation by A. M. W. Ter Laag), and German, is said to be the outcome of an investigation suggested by the publication of studies by Rorer (E. S. R., 29, p. 851) on the witches' broom disease of cacao in Surinam.

The organism, which is found in diseased shoots, indurated pods, and infected flower cushions of the cacao tree, is described as *M. perniciosus* n. sp. Mycelium isolated from diseased plants and used for inoculation gave no results, but spore material reproduced the disease.

While heavy shade appears to favor the fungus by the retention of moisture, it is thought best to decrease the shade gradually rather than suddenly. Drainage has the effect of strengthening the plants against attack. The diseased parts should be destroyed, and Bordeaux mixture should be applied to the trees in the form of a fine spray.

Coffee leaf disease (*Hemileia vastatrix*) in Uganda, S. SIMPSON and W. SMALL (*Proc. Internat. Cong. Trop. Agr., 3 (1914)*, pp. 365, 366).—In an abstract here given of this paper, it is said to have been established that no record exists of coffee trees having been attacked locally by any species of *Hemileia* other than *H. vastatrix*, and that so far spores of this fungus from *Coffea robusta* have failed to infect leaves of cultivated coffee.

The drier weather of 1913 arrested the disease. Bordeaux and Burgundy mixtures have continued to give good results, but other applications have been disappointing.

No acicidal stage of *H. vastatrix* has yet been found. At least 10 genera of the Rubiaceae occur in the Victoria Nyanza region, and 4 of these are known to harbor species of *Hemileia* in other localities.

Citrus canker, A. J. COOK (*Mo. Bul. Com. Hort. Cal., 3 (1914)*, No. 12, pp. 520, 521).—This is partly a brief notice of information, furnished mainly by Berger (E. S. R., 34, p. 649) and by Stevens (E. S. R., 31, p. 54), regarding the origin, distribution, symptoms, and results of citrus canker, and partly a discussion of protective measures, including quarantines by States.

Citrus canker in America. The outbreak of a new disease, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 26 (1915)*, No. 6, pp. 517, 518).—The author discusses an extract from a bulletin on citrus canker by Stevens (E. S. R., 31, p. 54) and one from the above article by Cook.

The discovery of the chestnut blight parasite (*Endothia parasitica*) and other chestnut fungi in Japan, C. L. SHEAR and N. E. STEVENS (*Science, n. ser., 43 (1916)*, No. 1101, pp. 173-176).—The presence of *E. parasitica* on chestnut trees in the vicinity of Nikko, Japan, was definitely established from material received from several sources. In addition to *E. parasitica*, *E. radicalis* has been found on the bark of *Pasania* sp., a genus closely related to *Quercus*. This seems to establish the fact that *E. radicalis* is indigenous to Japan and is not confined to the genus *Castanea*.

The chestnut bark disease in Vermont, R. M. ROSS (*Vt. Forestry Pub. 16 (1915)*, pp. 16, pls. 4).—It is stated that the chestnut blight, ascribed to *Endothia gyroza parasitica*, and said to be found in all the New England States, threatens to infect all the chestnut areas in Vermont. No methods have been found effective in checking the disease or in saving a tree when once badly diseased.

While wood once infected begins to deteriorate within two years after the death of the tree, timber cut before infection may be seasoned and kept for many years. Suggestions for the utilization of chestnut wood are given. Complete destruction of all infected material is insisted upon.

Diseases of Hevea in Ceylon, T. PETCH (*Proc. Internat. Cong. Trop. Agr.*, 3 (1914), p. 172).—In the abstract here given of this paper, it is stated that the diseases acquired by *H. brasiliensis* during its cultivation in the East for over 30 years have been comparatively few and mild.

The most important diseases of this tree in Ceylon at the present time are brown root disease (*Hymenochaete noxia*), pink disease (*Corticium salmonicolor*), dieback (*Botryodiploida theobromae*), and canker (*Phytophthora faberi*). The production of nodules and the decay of the tapped cortex are more serious phenomena which have not yet been traced to the agency of fungi.

[A larch leaf disease], A. A. LEBEDEVA (*Zhur. Bol'szni Rast.*, No. 4-5 (1914), p. 136; *abs. in Mat. Mikol. i Fitopatol. Ross.*, 1 (1915), No. 2, p. 61).—A serious larch leaf disease, attributed to *Hartigella laricis* and resulting in a complete defoliation and death of nursery stock, has been described by the author as occurring in the Province of Voronezh, Russia. Spraying with Lazurin (a prepared Bordeaux mixture) and removing affected leaves gave very good results.

Peridermium harknessii and *Cronartium quercum*, E. P. MEINECKE (*Science*, n. ser., 43 (1916), No. 1098, p. 73).—The author reports the successful inoculation of *Pinus radiata* with ascospores of *P. harknessii* and the fact that the mycelium of *C. quercum* winters over in the old green leaves of *Quercus agrifolia*. The uredinal sori on the young leaves are said to be the results of infection from the sori on the old leaves. The author claims that if *P. harknessii* is connected with *C. quercum*, this is a case of facultative heterocentrism in both generations.

Brown oak and its origin, P. GROOM (*Ann. Bot. [London]*, 29 (1915), No. 115, pp. 393-408).—An account is given of a study made on reddish or brown heartwood of individual trees of the species *Quercus robur* in Great Britain.

The change, which is little if at all injurious to the wood for a long time, is apparently due to a fungus, the conidiophores of which closely resemble those of Penicillium. On incipient brown oak of some specimens were produced small sphaerotiloid basidioearps which were identified by Massee as *Melanogaster variegatus broomianus*, but the identity of the conidiate fungus with the basidiate one was not established by pure cultures.

Results are also given of a study of the tannin in oak heartwood by W. P. Rial.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Birds of Porto Rico, A. WETMORE (*U. S. Dept. Agr. Bul.* 326 (1916), pp. 140, pls. 10).—This work is based upon investigations commenced in December, 1911, from which time continuous field work was carried on until September, 1912. All the principal regions of the island were visited, short trips having been made to the adjacent islands of Vieques and Culebra, and four days spent on Desches Island, in Mona Passage. As a result of this work more than 2,200 stomachs of birds collected at all seasons were available for laboratory study and investigation, about 2,000 of which were collected by the author. It is pointed out that the examination and results have additional importance as representing the first extended work of the kind carried on within the tropical regions of the Western Hemisphere.

In the introduction the author first presents the itinerary, following which he deals with the physiography of Porto Rico; bird life in cane fields, coffee plantations, and citrus groves; economic considerations; bird enemies of the mole cricket, sugar cane root borer, weevil stalk borer, and May beetle; methods of increasing birds; introduction of birds, etc.

The greater part of the work (pp. 17-129) is taken up by an annotated list of 178 species known to inhabit or visit Porto Rico. The data include the names by which the species is known, a brief account of its habits, and a statement regarding its food and economic status. In some cases detailed lists of insects and other animals, seeds, and fruits identified in the stomachs are given in systematic order, so that as the status of other forms of life becomes known the relation of the birds to them may be more easily ascertained. A bibliography of the literature relating to the ornithology of Porto Rico and a subject index are appended.

A peculiarity in the growth of the tail feathers of the giant hornbill (*Rhinoplax vigil*), A. WERMORE (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 497-500).

Strychnin sulphate.—Its effect on California valley quail, C. C. PIERCE and M. T. CLEGG (*Pub. Health Rpts. [U. S.]*, 30 (1915), No. 50 pp. 3601-3604).—The authors report experiments conducted which have been summarized as follows:

"In each case convulsions and death occurred within a period of two hours after administering the barley, and in each case the barley was reclaimed from the pouch of the squirrel after death, showing, what had already been proved, that strychnin is rapidly absorbed through the membranes of this organ.

"California valley quail may be fed, under natural conditions, relatively large amounts of strychnin sulphate without showing toxic symptoms. The minimum lethal dose by subcutaneous injection is 4 mg. per 100 gm. of body weight. The California ground squirrel (*Citellus beecheyi*) is very susceptible to strychnin sulphate; 0.09 mg. per 100 gm. of body weight produced convulsions. Nineteen grains of barley, containing 2.7 mg. of strychnin sulphate, when retained in the pouch of the ground squirrel, proved fatal. Poisoned barley, as used for ground squirrel eradication, does not cause the death of California valley quail under natural feeding conditions."

Five new mammals from Mexico and Arizona, E. A. GOLDMAN (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 132-137).

Descriptions of a new genus and seven new races of flying squirrels, A. H. HOWELL (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 109-113).

Five new rice rats of the genus *Oryzomys* from Middle America, E. A. GOLDMAN (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 127-130).

The distribution and combat of the field mouse in Bavaria from 1902 to 1913, L. HILTNER (*Landw. Jahrb. Bayern*, 4 (1914), No. 5, pp. 437-478, figs. 24).—A description of the dissemination of this pest and of control work in Bavaria.

A systematic account of the grasshopper mice, N. HOLLISTER (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 427-489, pl. 1, figs. 3).

Medical and veterinary entomology, W. B. HERMS (New York: The Macmillan Co., 1915, pp. XII+393, figs. 228).—In this work the subject is dealt with under the following headings: Parasites and parasitism; insect anatomy and classification; insect mouth parts; how insects carry and cause disease; cockroaches, beetles, and thrips; the lice; bedbugs and cone noses; mosquitoes; mosquitoes as disease bearers; mosquito control; buffalo gnats and horse flies; the common house fly; house fly control; bloodsucking muscids—tssetse flies, stable flies, horn flies; myiasis; fleas and louse flies; ticks; mites; and venomous insects and arachnids—bees, wasps, spiders, scorpions, etc. A general classification of bacteria and protozoa is appended.

[Papers on insects and insect control] (*Ann. Serv. Épiphyties, Mem. et Rap.* 1 (1912), pp. VIII+462, pls. 3, figs. 80).—The papers here presented of interest to economic entomologists include the following: *Icerya purchasi* in France

and the Acclimation of *Novius cardinalis*, by P. Marchal (pp. 13-26); The Acclimation of *N. cardinalis* in Gardens of the Peninsula of Cape Ferrato Invaded by *I. purchasi*, by G. Poirault and A. Vuillet (pp. 27-33); Protection of Cultivated Plants from Insects of Exotic Origin, by A. Vuillet (pp. 34-50); A Note on the Necessity of the Employment of Poisonous Substances, Particularly Arsenate of Lead, in Agriculture, by E. Roux (pp. 51-56); Opportunity for the Employment of Arsenicals, and Particularly Arsenate of Lead, in Agriculture, by P. Marchal (pp. 57-62); Tests of the Toxicity of Some Arsenical Compounds Employed in Agriculture, by H. Fabre (pp. 63-76); A Consideration of the Use of Arsenicals in the Southern Section, by F. Picard (pp. 77-79); The Potato Tuber Moth (*Phthorimaea operculella*), by F. Picard (pp. 106-116); Studies of a Disease of the Peach Tree in the Valley of the Rhone Caused by *Xylcborus dispar*, by J. Beauverie (pp. 186-195); The Fight Against *Diaspis pentagona* in Italy, by G. Gastine (pp. 196-219); The Asparagus Fly (*Platyphara paeциloptera*) in the Environs of Paris, by P. Lesne (pp. 228-247); The Cochylis and Eudemis Moths in 1912, by P. Marchal (pp. 248-252); Studies of the Cochylis and Eudemis Moths in Bordeaux in 1912, by J. Feytaud (pp. 253-330); The Cochylis and Eudemis Moths in the Valley of the Loire, by Vezin and L. Gaumont (pp. 331-338); Observations on the Cochylis and Eudemis Moths in Burgundy in 1912, by A. Paillot (pp. 339-351); Report on the Cochylis and Eudemis Moths in Southern France, by F. Picard (pp. 352-361); Tests of Illuminated Traps in Champagne in 1911-12, by J. Chatanay (pp. 365-371); Studies of the Vegetable Parasites of Cochylis and Eudemis Moths, by G. Fron (pp. 372-378); Studies of the Pathogenic Action of Divers Coccoacilli of the May Beetle, Silkworm, and Cochylis and Eudemis Moths, by E. Chatton (pp. 379-391); and A Note on the Coccidae of West Africa, by P. Vassière (pp. 426-432).

Work of the colonial entomologist, R. MAYNÉ (*Bul. Agr. Congo Belge*, 5 (1914), No. 4, pp. 577-600, figs. 8).—The author here deals with the enemies of rubber in Belgian Congo, and presents a note on an enemy of coffee (*Stephanococcus coffee*) and a brief account of the citrus butterfly (*Papilio demoleus*).

[Report of the entomologist of Southern Nigeria]. W. A. LAMBORN (*Ann. Rpt. Agr. Dept. South. Nigeria*, 1913, pp. 21-39).—In this report for the period from May 26 to December 31, 1913, the author discusses the insect enemies of cotton, cacao, maize, guinea corn, peanuts, etc. Three species of ticks, namely, *Boophilus annulatus decoloratus*, *Rhipicephalus simus*, and *Amblyomma variegatum*, are said to abound in the district.

Insect pests of wheat, W. B. GURNEY (*Dept. Agr. N. S. Wales, Farmers' Bul. 162* (1915), pp. 32-40, figs. 8).—A brief account of the more important insect enemies of wheat in New South Wales.

Some of the more important truck crop pests in Georgia, W. V. REED (*Ga. Bd. Ent. Bul. 41* (1915), pp. 39, figs. 29).—A brief popular account is given of the more important insect enemies of truck crops and means for their control.

Carbon bisulphid and its use for grain fumigation, W. H. GOODWIN (*Mo. Bul. Ohio Sta.*, 1 (1916), No. 3, pp. 86-90, figs. 3).—Directions are given for the practical use of carbon bisulphid as an insecticide.

[Cranberry insects in Wisconsin], O. G. MAULDE (*Wis. State Cranberry Growers' Assoc. [Proc.]*, 28 (1915), pp. 15-17).—This is a report of the occurrence of, and work of the season of 1914 with, the cranberry fruit worm, cranberry leaf miner, and cranberry tip worm.

Blueberry insects in Maine, W. C. Woons (*Maine Sta. Bul. 244* (1915), pp. 245-288, pls. 4, figs. 3).—In his introduction the author first considers the status of the blueberry industry in Maine, which is restricted in large part to the

blueberry barrens of Washington County, comprising some 250,000 acres. It is stated that in 1912 90,000 bu. of blueberries were canned and the industry valued at \$2,000,000. Three species of blueberries occur on the barrens, namely, *Vaccinium pensylvanicum*, *V. canadense*, and *V. vacillans*, but the first two of these predominate decidedly. Since *V. canadense* ripens about 10 days later than *V. pensylvanicum* the berry season is fairly long.

Accounts are given of eight insects of economic importance, all but one of which attack the fruit. The present account of the apple maggot is more at length than that previously noted (E. S. R., 32, p. 350). The maggot is the most important enemy of the blueberry in Washington County, to which locality the pest is largely restricted so far as this crop is concerned. A hymenopterous parasite, *Biopteris rhagoletis*, previously noted (E. S. R., 34, p. 456), was reared in considerable numbers from puparia obtained from blueberries in 1913, which apparently reduced the number of maggots considerably during the summer of 1914. With the large crop in 1913 only from 1 to 2 per cent was attacked, but the yield in 1914 was so small that from 8 to 10 per cent of the fruit was maggoty and conditions were much the same in 1915. It is stated that no measures aimed at complete control of the pest have proved really practical but that with an ordinary yield no elaborate system of control is needed. Burning the plains, as is commonly done, is a practice to be highly recommended since it not only restores the fertility of the land but destroys the puparia which lie near the surface of the soil.

A new cecidomyiid, i. e., Itoniid, though found in the fruit in considerable numbers, is not of economic importance since it infests only decaying or decayed berries. Descriptions of this species and its several stages under the name *Lasioptera fructuaria* by E. P. Felt are incorporated in the account.

The pomace fly is said to have been reared in great numbers from blueberries placed in cages in the insectary as soon as the fruit had become a trifle old and had lost its firmness. It is pointed out that unless stored berries are packed securely and guarded against the attack of this fly, it may prove to be a very serious pest.

The currant fruit weevil (*Pseudanthonomus validus*) is quite widely distributed in Maine as a blueberry pest, occurring at both Orono and Cherryfield, the only places at which extensive collections of berries have been made for the study of their insect enemies. So far as known it is confined to the low blueberries (*V. pensylvanicum* and *V. canadense*). Hibernation takes place in the adult stage. Oviposition commences about the middle of June while the berries are still small and green, the egg usually being placed in one of the calyx lobes. On hatching out, the larva tunnels to the center of the berry, leaving behind it a hardened reddish trail, which is very conspicuous in the green pulp. A single berry is said to furnish sufficient nourishment for one weevil, all parts of the fruit being eaten except the outer coat of the seeds, and the berry is left just a shell around a mass of fine brown frass. There is but one generation a year in Maine. A description of its several stages by W. D. Pierce is included.

A fruit caterpillar, thought to be *Epinotia fasciolana*, is, next to the maggot, the insect most commonly found in the fruit. This pest, while very abundant in 1913, was so extensively parasitized that it was quite rare the following year and had not appreciably reestablished itself in 1915. It appears to be generally distributed throughout the State. The eggs are deposited singly on the outside of the berry while it is still green, usually somewhere around the calyx lobe. Upon hatching out in most cases the larva enters the berry near the calyx end, usually on the outside of the berry at the base of one of the sepals, but some enter by the calyx cup and a few near the stem end. If

one berry does not contain enough food the larva may make its way to one which has been webbed to it. In 1913 its numbers were greatly reduced by an ichneumonid parasite of the genus *Pimpla*.

The blueberry damsel bug (*Nabis rufuscatus*), which probably occurs throughout the State, deposits its eggs in the fruit and the nymphs, which are predaceous, live upon the plant, but this seems to be the only way in which the blueberry is directly concerned in their life cycle. Occasionally a little scale of the genus *Pseudococcus* is found in the calyx end of the berry.

In addition to the insects which attack the fruit, to which particular attention was paid by the author, a leaf beetle, namely, *Galerucella decora*, was observed to be decidedly injurious to the foliage of the blueberry in Maine. It is said to be widely distributed through the State and in the vicinity of Orono to have been very abundant during the past three seasons and to have killed a considerable number of blueberry bushes. It hibernates in the adult stage, and the eggs are deposited about the middle of June. The larvae eat the leaves very rapidly and in great amount, the leaves being skeletonized and only the brown ribs and upper epidermis left. Bushes which are defoliated two or three years in succession usually are killed.

Insects affecting the coconut palm in Trinidad, F. W. URICH (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 6, pp. 200-203).—An annotated list of the more important insects of the coconut palm in Trinidad.

Insects as carriers of the chestnut blight fungus, R. A. STUDHALTER and A. G. RUGGLES (*Penn. Dept. Forestry Bul.* 12 (1915), pp. 33, pts. 4).—Following a brief review of the literature relating to the transmission of plant diseases by insects, the authors report the results of investigations conducted, including those obtained from cultures, the microscopic examination of centrifuged sediments, etc. The work has been summarized as follows:

"Each insect tested was placed in a flask containing 100 cc. of sterile water, kept there for at least several hours, small quantities of the water plated out in dilution plates, and the wash water centrifuged in case positive results were obtained. Tests were made of 21 ants used in certain laboratory and insectary experiments in which they had been permitted to run over chestnut bark bearing spore horns or active perithecial pustules of the chestnut blight fungus (*Endothia parasitica*). Five of these 21 ants were found to be carrying spores of the chestnut blight fungus.

"Tests were also made of 52 insects and 2 spiders brought in from the field. All but 3 of these were picked directly from the chestnut blight cankers. Both of the spiders yielded negative results, while 19 of the 52 insects from the field were found to be carrying spores of *E. parasitica*. Positive results were obtained from insects in the orders Hemiptera, Coleoptera, Diptera, and Hymenoptera. The only other order of insects represented was the Lepidoptera, of which only 2 individuals were tested, both with negative results.

"The number of viable spores of the blight fungus carried varied from 74 to 336,960 per insect. The cultures from 3 insects contained no fungus colonies except those of *E. parasitica*. Each of the 8 individuals tested of *Leptostylus macula*, one of the beetles which feeds on pustules of the blight fungus, yielded positive results. The 3 highest positive results obtained, 336,960, 145,340, and 8,538, were from *L. macula*. It was demonstrated that the spores of the blight fungus were easily shaken from the body of this beetle by its own movements.

"From the rate of development of the colonies of *E. parasitica* in cultures, it was determined that the insects from the fields were carrying pycnospores almost exclusively. A microscopic examination of the centrifuged sediments showed a very few ascospores, and these from only 5 insects. Pycnospores were present in the sediment from every insect yielding positive results. The

insects tested, even *L. macula*, which eats the pustules, were therefore carrying pycnospores almost exclusively. Most of the pycnospores were probably brushed off from normal or diseased bark, or both, by the movements of the insects over these surfaces. Some were probably obtained while eating the pustules, and some may have been obtained from the soil around the bases of diseased trees.

"Most of the insects were also carrying spores of fungi other than *E. parasitica*. The number of species of other fungi varied from 0 to 7 in the cultures, but was shown by microscopic examination of the centrifuged sediments to be greater, in at least some cases. In proportion to size, insects may carry a greater number of spores of the blight fungus than birds.

"We are led to the conclusion that some insects carry a large number of spores of the blight fungus, and that they are important agents in the local dissemination of this disease. This is especially true of the beetle, *L. macula*."

A list of 55 titles of the literature cited is appended.

Hydrocyanic acid gas against household insects, L. O. HOWARD and C. H. POPENOE (*U. S. Dept. Agr., Farmers' Bul. 699* (1916), pp. 8).—This is a revision of Bureau of Entomology Circular 163, previously noted (*E. S. R.*, 28, p. 352).

Orthoptera of the Yale-Dominican expedition of 1913, A. N. CAUDELL (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 491-495).

The genera of the tettiginiid insects of the subfamily Rhaphidophorina found in America north of Mexico, A. N. CAUDELL (*Proc. U. S. Nat. Mus.*, 49 (1916), pp. 655-690, figs. 28).

[**Migratory locusts in South America**] (*Bul. Dept. Agr. Trinidad and Tobago*, 14 (1915), No. 6, pp. 191-199, pls. 5).—Several papers are here presented relating to the subject, including A Report on Locusts in Venezuela, by W. G. Freeman (pp. 191-194); Notes on the South American Migratory Locust (*Schistocerca paranensis*), by F. W. Urich (pp. 194-197); Report on the Inoculation of Locusts with *Coccabacillus acridiorum*, by J. B. Rorer (pp. 197, 198); and The Manurial Value of Locusts, by A. E. Collens (p. 199).

Inoculation experiments with *C. acridiorum* show that its virulence can be increased for the Venezuelan locust (*S. paranensis*) in a way similar to that used in Yucatan and Argentina. An experiment with the giant locust (*Tropidacris dux*) shows that the organism is virulent for it also.

Jerusalem's locust plague, J. D. WHITING (*Nat. Geogr. Mag.*, 28 (1915), No. 6, pp. 511-550, figs. 25).—The author reviews the history of former locust invasions and describes and illustrates the great devastation caused by locusts in Jerusalem and the means that have been taken to combat them.

Observations on *Chermes* spp. in Switzerland, N. A. CHOLODKOVSKY (*Russ. Ent. Obozr.*, 14 (1914), No. 2-3, pp. LXXIX-LXXXIII; abs. in *Rev. Appl. Ent.*, 3 (1915), Ser. A, No. 7, pp. 343, 344).—This reports observations on the biology of *Chermes* spp.

Identity of *Eriosoma pyri*, A. C. BAKER (*U. S. Dept. Agr., Jour. Agr. Research*, 5 (1916), No. 23, pp. 1115-1119, fig. 1).—As stated by the author, this paper was written in order to reinstate the woolly aphid described by Fitch from apple (*Julus* spp.) roots, to point out its distinctness from the woolly apple aphid (*E. lanigerum*), with which it has been confused, and to place it among the species of the genus to which it properly belongs, namely, *Prociphilus*. In his studies the author has had Fitch's original notes on the species and his type of *Prociphilus pyri* at hand. Descriptive notes and figures of the species of *Prociphilus* are given as an aid in the placing of *P. pyri*.

Destruction of body lice, agents in the transmission of recurrent fever and exanthematosus typhus, by oil of eucalyptus, E. SERGENT and H. FOLEY (*Bul. Soc. Path. Exot.*, 8 (1915), No. 6, pp. 378-381; abs. in *Amer. Jour. Trop. Diseases*

and *Prev. Med.*, 3 (1915), No. 2, pp. 109-111).—The authors find that the oil of eucalyptus is an efficient disinfection agent for use against body lice in loco, on the clothing, and on the body while still clothed.

Descriptions of new species and genera of Lepidoptera from Mexico, H. G. DYAR (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 365-409).

Lepidoptera of the Yale-Dominican expedition of 1913, H. G. DYAR (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 423-426).

Report on the Lepidoptera of the Smithsonian biological survey of the Panama Canal Zone, H. G. DYAR (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 139-350).

New genera and species of Microlepidoptera from Panama, A. BUSCK (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 1-67).

Contributions toward the knowledge of the injurious Microlepidoptera of the fir and spruce, I. TRÄGÅRDH (*Skogsvidrdsför. Tidskr.*, No. 11 (1915), pp. 313-374, figs. 49; *abs. in Rev. Appl. Ent.*, 3 (1915), Ser. A, No. 6, pp. 290-292).—The species here considered are *Dioryctria schützeella*, *Pandemis ribeana*, *Grapholitha (Epiblema) todelta*, *G. (Epiblema) banana*, *Argyresthia illuminella*, *Cacacia picanea*, *Evetria resinella*, *Heringia dodecella*, *Cedestis gyselinella*, *Dyscedestis farinatella*, and *Oenerostoma pinariella*. A bibliography of 28 titles is appended.

The noctuid moths of the genera *Palindia* and *Dyomyx*, H. G. DYAR (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 95-116).

The pickle worm or cucumber worm (*Diaphania nitidalis*), H. GARMAN (*Kentucky Sta. Dept. Ent. and Bot. Circ.* 3 (1915), pp. 7, figs. 5).—This insect has been the source of considerable injury in Kentucky during the past three or four years, particularly to cantaloups and cucumbers. The injury commences about the middle of July and is at its height during August and early September. Several broods which overlap develop during this period. Treatment consists in rotation, the gathering and destruction of badly infested fruit, and plowing and harrowing immediately after the removal of the crop. Spraying with arsenicals may at times be employed to advantage but should be practiced with care.

The practical employment of the cacao moth parasite, W. ROEPKE (*Meded. Proefstat. Midden-Java*, No. 18 (1914), pp. 25-27; *abs. in Rev. Appl. Ent.*, 3 (1915), Ser. A, No. 6, pp. 818, 914).—A description is given of the manner of rearing and liberating cacao moth parasites and of the destruction of hyperparasites.

Two new Canadian Diptera, J. M. ALDRICH (*Canad. Ent.*, 48 (1916), No. 1, pp. 20-22).—*Ezorista casar* reared from *Archips argyrospla* at Simcoe, Ontario, and *Fronitia spectabilis* collected at Wabamie, Ontario, are described as new to science.

New western and southwestern Muscoidea, C. H. T. TOWNSEND (*Jour. N. Y. Ent. Soc.*, 23 (1915), No. 4, pp. 216-234).

Diagnoses of new genera of muscoid flies founded on old species, C. H. T. TOWNSEND (*Proc. U. S. Nat. Mus.*, 49 (1916), pp. 617-633).

The house fly, F. W. FITZSIMONS (*London and New York: Longmans, Green & Co.*, 1915, pp. VI+89, figs. 22).—A small book of a popular nature which emphasizes the importance of combating the house fly.

The sporogony of *Hæmoproteus columbae*, HELEN ADIE (*Indian Jour. Med. Research*, 2 (1915), No. 3, pp. 671-680, pls. 3).—The author concludes that "pigeons at the places and the times indicated are very heavily infected with *Hæmoproteus*; no other blood parasites were found. Lychee flies associated with these pigeons are also very heavily infected with the sexual stages of a parasite analogous to *Proteosoma* and the malarial parasite. Where flies are

rare, pigeon infection is also rare. Kasauli pigeons show no flies and are, as far as my experience goes, free from infection.

"The development of Hæmoproteus can be traced in the fly; the oökinete, zygote, oöcyst, and sporozoite stages have all been demonstrated. Sporozoites have been seen in vast numbers in the salivary glands and streaming down the salivary duct. Both sexes of *Lynchia* carry the infection. Laboratory bred flies placed on infected birds have shown in due course both zygotes and sporozoites of the same type as those of naturally infected flies. Kasauli pigeons for good reasons thought to be uninfected (but not laboratory hatched) have become infected by flies taken off heavily infected Ambala birds (flies afterwards dissected and found infected). The sporogony of Hæmoproteus in this *Lynchia* is similar to that of *Proteosoma* and the malaria parasite. It is another instance of the cycle of Ross."

Fighting the fly peril, C. F. PLOWMAN and W. F. DEARDEN (*London: T. Fisher Unwin, Ltd., 1915, pp. 127, pls. 7, figs. 4*).—A popular and practical handbook.

Report on a mosquito survey at the mouth of the Connecticut River, P. L. BUTTRICK (*Connecticut State Sta. Bul. 189 (1915), pp. 5-32, pl. 1*).—This is a detailed report of a survey made with a view to ascertaining the location and character of mosquito breeding places, to determine how they can best be eliminated, and to estimate roughly the probable cost. It is thought that this survey with the accompanying map makes it possible for those interested to decide what work is most necessary, where money can best be spent, and the approximate cost.

Anopheles as a winter carrier of plasmodium.—The mosquito as a prophylactic indicator, M. B. MURZMAIN (*Pub. Health Rpts. [U. S.], 30 (1915), No. 29, pp. 217-221*).—The author reports upon investigations conducted at Scott, Miss., from February 3 to June 1, 1915.

During the three months from February 9 to May 9, 1,000 Anopheles mosquitoes collected were dissected and examined but no forms suggestive of the malarial plasmodium were encountered. Two mosquitoes (*Anopheles quadrimaculatus*) were found infected on May 15 and a third on May 26. The findings indicate that "at any time previous to May 15, in the locality investigated, protection from malaria may be secured by treating with quinin, all the human carriers so that the insect carriers may not be permitted to carry out their rôle in completing the cycle. Failing this, prophylactic measures among healthy and other susceptible persons may be instituted any time, from May 15 to June 1, when it is considered the completion of the mosquito cycle in this locality makes preventive measures urgent."

The duck as a preventive against malaria and yellow fever, S. G. DIXON (*Jour. Amer. Med. Assoc., 63 (1914), No. 14, p. 1203*).—Attention is called to the habit of ducks of feeding upon mosquito larvae.

Anastrepha serpentina, a new pest of fruits in Brazil, J. S. TAVARES (*Brotaria, Ser. Zool., 15 (1915), No. 1, pp. 52-54; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 7, p. 387*).—In addition to the fruit flies *A. fraterculus*, *Ceratitis capitata*, and *Lonchaea aenea* which occur in Brazil, *A. serpentina*, which attacks the sapodilla (*Sapota achras*), has been discovered. About 30 days are required for its larval development and 15 for the pupal.

The biopathological relations of the Mediterranean fruit fly (*Ceratitis capitata*) and citrus fruits, L. SAVASTANO (*Ann. R. Staz. Sper. Agrum. e Frutticolt. Acireale, 2 (1914), pp. 97-128; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, pp. 604, 605*).—The attack of the Mediterranean fruit fly is aggravated by an increase in the sugar content of citrus with the resulting decrease in acidity.

A bibliography of 47 titles is given.

Two new species of Pipunculus. F. KNAB (*Proc. Biol. Soc. Wash.*, 28 (1915), pp. 83-85, pl. 1).—*Pipunculus industrius* and *P. vagabundus*, both reared from the sugar beet leafhopper (*Eutettix tenella*) at King City and Pleasanton, Cal., are described as new to science.

Notes on some Virginian species of Platypeza. N. BANKS (*Jour. N. Y. Ent. Soc.*, 23 (1915), No. 4, pp. 213-216, pl. 1).

The life history and control measures for the cereal leaf beetle (Lema melanopus). G. KADOCSA (*Kisérlet. Közlem.*, 18 (1915), No. 1, pp. 109-178, pls. 8, figs. 3).—A detailed report of studies of this pest conducted at the Royal Entomological Station in Budapest.

The western 12-spotted cucumber beetle. E. O. ESSIG (*Univ. Cal. Jour. Agr.*, 3 (1915), No. 1, pp. 12-15, figs. 3).—This account relates to *Diabrotica soror*, a native of the Western States and especially abundant in California, where it is a source of considerable injury.

Problem of the bark beetle. J. M. SWAINE (*Canad. Forestry Jour.*, 11 (1915), No. 6, pp. 89-92, figs. 2).—This account is based upon work previously noted (E. S. R., 32, p. 551).

Species of Rhynchites and Anthonomus pomorum injuring orchards. J. F. SCHREINER (*Trudy Büro Ent. [Petrograd]*, 2 (1914), No. 14, 3, enl. ed., pp. 65, figs. 32; abs. in *Rev. Appl. Ent.*, 3 (1915), Scr. A, No. 9, pp. 533-535).—Seven species of Rhynchites injurious in Russia are considered.

Boll weevils hibernating in cotton seed (Mississippi Sta. Bul. 173 (1916), pp. 28, 29, fig. 1).—This records the discovery of three live weevils in 2 lbs. of seed cotton in January while ginning a sample by hand. The weevils are said to have been inside the seeds, having entered apparently after the seeds were nearly or quite mature, as the seed coats were about normal.

The Mexican bean weevil. E. O. AMUNDSEN (*Mo. Bul. Com. Hort. Cal.*, 5 (1916), No. 1, pp. 33, 34, figs. 3).—A Mexican bean, known as "guamuchile," is often found infested by *Bruchus limbatus*. It is also found in the seeds of other legumes and if unchecked renders them unfit for food or seed.

New genera of chalcidoid Hymenoptera. A. A. GIRAUT (*Jour. N. Y. Ent. Soc.*, 23 (1915), No. 3, pp. 165-173).—Among the species here described of economic importance are *Holanusomyia pulchripennis* n. g. and n. sp., reared from the citrus mealy bug on bamboo at Manila, Philippine Islands; *Anagyrella corrina* n. g. and n. sp., reared from *Pseudococcus* sp., at Fresno, Cal.; *Metallonoidea brittanica* n. subg. and n. sp., reared from the oyster shell scale, at Manchester, England; *Pseudhomalopoda prima* n. g. and n. sp., reared from *Chrysomphalus aonidum* and *Ateurocanthus woglumi*, at Kingston, Jamaica; and *Paraleurocerus bicoloripes* n. g. and n. sp., reared from a cherry leaf miner (*Lithocelletis* sp.), at Woods Hole, Mass.

Vespoid and sphecid Hymenoptera collected in Guatemala by W. P. Cockerell, S. A. ROHWER (*Proc. U. S. Nat. Mus.*, 47 (1915), pp. 513-523).

West Indian wasps. H. A. BALLOU (*Agr. News [Barbados]*, 14 (1915), No. 34, p. 298, figs. 4).—A brief account of the more important wasps occurring in the West Indies.

Observations on the biology of Ixodidae, II. G. H. F. NUTTALL (*Parasitology*, 7 (1915), No. 4, pp. 408-456).—In this second part of the work previously noted (E. S. R., 29, p. 58) the author reviews the literature relating to the biology of 14 species of ticks, in part, and reports original observations.

[Studies of *Cimex*], F. W. CRAGG (*Indian Jour. Med. Research*, 2 (1915), No. 3, pp. 698-720, pls. 3, figs. 2).—The author's work with *Cimex* is reported in two papers, the first relating to fertilization (pp. 698-705) and the second consisting of anatomical and physiological studies of the alimentary tract (pp. 706-720).

On the life history and morphology of *Clonorchis sinensis*, II. KOBAYASHI (*Centbl. Bakter. [etc.], 1. Abt., Orig.*, 75 (1915), No. 4, pp. 299-318, pls. 4).—This report of studies at the Imperial Institute for Infectious Diseases has been summarized as follows:

"Liver distomiasis in Japan is caused by *C. sinensis*. The natives in the district where the disease is prevalent are infested with the parasites through eating fresh-water cyprinoid fishes raw that are the intermediate hosts.

"Experimentally the following 12 species are ascertained to be the intermediate hosts of the distome: *Pseudorasbora parva*, *Leucogobio güntheri*, *L. mayeda*, *Sarcocheilichthys variegatus*, *Pseudoperitampus typus*, *Paracheilognathus rhombatum*, *Acheilognathus lanceolatum*, *A. limbatum*, *A. cyanostigma*, *Abottina pseuma*, *Bivium zzzera*, and *Carassius auratus*.

"The encysted larva in the fish grows and reaches maturity in the cat, the dog, the rabbit, the guinea pig, and the rat. In the final host the cyst ruptures and the larva is set free. During the development in the final host, the spines of the 'cuticula' enlarge and then disappear. The size relations of the oral and ventral suckers are reversed. The final shape and position of the testes and the ovary are attained in 7 days and the egg formation begins in from 12 to 15 days.

"The parasite matures in from 23 to 26 days. Yellowish or brownish pigment of the adult is probably degenerated shell material contained in the yolk cells. Semile degeneration is found in larger specimens in which the vitellaria are partly [reduced] or wholly disappear, the pigment is present, and the uterus is empty. The liver distome in Japan constitutes a single species (*C. sinensis*)."

An outline of the morphology and life history of *Crithidia leptocoridis* n. sp., IRENE McCULLOCH (*Univ. Cal. Publ., Zool.*, 16 (1915), No. 1, pp. 22, pls. 4, fig. 1).—The flagellate parasite *C. leptocoridis* occurs in immense numbers in the intestinal tract of the common boxelder bug (*Leptocoris trivittatus*).

Studies in the life history of an ameba of the *Limax* group (Vahlkampfia calkensi), MARY J. HOGUE (*Arch. Protistenk.*, 95 (1914), No. 2, pp. 152-163, pls. 3).—Most of the oysters found around New York are said to be infested with this ameba, while the Cape Cod oysters and those found near Woods Hole are peculiarly free from it.

Identification of the stages in the asexual cycle of *Bartonella bacilliformis*, the pathogenic organism of verruga, and their bearing on the etiology and unity of the disease, C. H. T. TOWNSEND (*Jour. Wash. Acad. Sci.*, 5 (1915), No. 21, pp. 662-667).—The author reviews studies relating to verruga which appear to indicate conclusively that the *Bartonella* is a protozoan, and attempts to interpret correctly the stages in the asexual cycle of *B. bacilliformis*. Accounts relating to verruga and its transmission by *Phlebotomus verrucarum* have previously been noted (E. S. R., 32, pp. 248, 350).

FOODS—HUMAN NUTRITION.

The velocity of the staling of bread, J. R. KATZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis. en Natuurk. Afdelen.*, 23 (1914), pt. 1, pp. 652-655).—In continuation of previous work (E. S. R., 28, p. 861), the author reports experimental data indicating that the velocity of the staling of bread and its loss of imbibing power (which is thought to depend on a physical change in the starch of the flour so that it becomes harder and less capable of holding water) do not run quite parallel. It was found that the diminished capacity of the starch to absorb water took place the more rapidly, and that the vapor

pressure of both fresh and stale bread was approximately equal to that of pure water.

The staling of bread, J. R. KATZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis. en Natuurk. Afdeel.*, 23 (1914), pt. 1, pp. 655-658).—From the results of a series of tests to determine the imbibing power and solubility of bread made of meals from several different kinds of grain the conclusion is given that the staling of bread is connected with a change which takes place not only with wheat and rye starch but also with all varieties of starch, but that it leads to practically important results only in the case of wheat and rye starch.

The staling of bread from the physiological-chemical standpoint, I-III, J. R. KATZ (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 104-129; 136-146, fig. 1; 147-151).—In the first of these papers, experimental data on the chemical and physical changes which take place when bread becomes stale are reported. These are in agreement with the work of Neumann (E. S. R., 22, p. 356). The author concludes that the principal cause of the staling of bread is a change in the starch, brought about by baking, by which the starch granules become harder and less capable of holding water and by which a part of the soluble polysaccharids become insoluble. At the same time there is a transference of the water in the starch to the gluten. Furthermore, the consistency of the gluten skeleton of bread influences the general texture of the bread.

In the second paper the author reports a further investigation of the changes produced in the starch granules of bread by baking and during staling. These data indicate that during baking the high temperature disturbs the equilibrium which ordinarily exists between starch, water, and gluten, and fresh bread results. During staling this equilibrium tends to be restored; at higher temperatures, accordingly, bread remains comparatively fresh.

In the third paper, from the data of experiments reported, he concludes that the starch granules of sago, rice, potatoes, barley, corn, oats, lentils, and marena undergo the same changes in the baking and staling of bread as occur in wheat and rye bread.

Changes in the microscopical structure of bread during staling, E. VERSCHAFFELT and E. VAN TEUTEM (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 95 (1915), No. 2-3, pp. 130-135, pls. 2).—The authors describe studies of the microscopy of fresh and stale bread. The findings of these experiments are in agreement with Katz's theory of the staling of bread noted above.

How to grow the peanut and 105 ways of preparing it for human consumption, G. W. CARVER (*Alabama Tuskegee Sta. Bul.* 31 (1916), pp. 35).—In addition to information regarding the planting, cultivation, and food value of the peanut, 105 recipes are given for the use of peanuts in cookery.

Recent observations in the use of soy bean in infant feeding, J. F. SINCLAIR (*N. Y. State Jour. Med.*, 16 (1916), No. 2, pp. 83-88).—The results are reported of feeding soy-bean gruel to 74 infants under three years of age, who were suffering with gastrointestinal disturbances. Owing to its high protein and fat content the gruel proved very efficient in checking the weight losses which occur so frequently during these disorders.

In conclusion other uses of soy-bean flour are mentioned: "It has proved useful when mixed with cereals, oatmeal, or barley jelly. It may be used in broths. Where condensed milk must be employed it is of service because it supplies the protein and fat which is needed and which condensed milk lacks."

Ice-cream making, A. C. BAER (*Wisconsin Sta. Bul.* 262 (1916), pp. 36, figs. 4).—The material in this bulletin is based upon the results of about 600 freezing tests with plain ice creams made by the station under commercial conditions, and may be summarized briefly as follows:

The body (general firmness) and texture (smoothness) of ice cream are influenced by a number of factors, such as the age and kind of cream used, the amount of milk fat or other milk solids in the mixture, and the kind and amount of filler used. In order to secure good body and texture the cream should be aged from 24 to 48 hours at a low temperature before being frozen. If the cream is properly aged the product retains good body and texture for a much longer period than otherwise. Experiments with creams having percentages of milk fat varying from 8 to 30 per cent showed that ice cream made from cream having less than 18 per cent of fat was weak in body and poor in texture. The thinner the cream used the more filler was needed to accomplish the desired results.

The time of freezing and the speed of the freezer is important. A mixture frozen too rapidly was coarse in texture and weak in body, while if the speed of the dasher or disks was too low the cream was not whipped to the proper consistency and smoothness.

Since an excessive overrun results in a product of poor quality it should be avoided. A number of factors which influence overrun were studied, and these showed in general that by careful standardizing of the ice cream "mix" and by regulating the freezing operation it was possible to obtain a uniform overrun from day to day. A raw cream produced a higher overrun than a pasteurized cream. Aging a pasteurized or homogenized cream made a higher swell possible. Rapid freezing resulted in a lower overrun than when sufficient time was given to properly whip up the mixture. The kind and amount of filler did not seem to affect the overrun. A high swell resulted in an open-textured, light, foamy ice cream, and such a product was of poorer quality than one with less overrun. Because the amount of overrun affects the weight of ice cream, the nutrients in a given volume will also be affected; a high overrun ice cream contains less nutrients than a lower overrun product.

The flavor of ice cream is influenced by several factors, among them quality of flavoring materials, richness of cream, taints of cream, kind of cream, filler, and storage of the finished product. A pure extract of vanilla will produce a more pleasant flavor than cheap, imitation compounds. The natural fruit flavors are more desirable than the cheaper grade of extracts. An old, tainted, partly sour cream can not be made into a good ice cream. An excessive use of a low grade gelatin or ice-cream powder always can be detected in the flavor.

Considerable data are also given regarding the processes of freezing; the temperature during freezing; packing; and testing. A few simple formulas are given together with suggested score cards for judging ice cream. It is stated that creameries and milk plants can profitably make ice cream without much additional equipment, and if advantageously located they can install an equipment for manufacturing ice cream for about \$500.

The manufacture of ice creams and ices, J. H. FRANDSEN and E. A. MARKHAM (*New York: Orange Judd Co., 1915, pp. XIV+315, figs. 106*).—The chapters included in this book are the cream supply; the bacteriology of ice cream; the care of milk and cream at the factory; condensed milk, milk powder, and homogenized cream; stabilizers; flavoring; standardizing the ice cream mixture; preparing the ice cream mixture; classification of ice cream; ice cream formulas; water ices and sherbets; fancy molded ice creams; the freezing process; refrigeration; the economical operation of the refrigerating plant; scoring ice creams and ices; the ice cream factory, its location and equipment; factory management; by-products and side lines; and ice cream as a side line in the local creamery.

[Report of food and drug laboratory], H. E. BARNARD (*Ind. Bd. Health, Ann. Rpt. Chem. Div. Lab. Hyg.*, 9 (1915), pp. 1-153, figs. 39).—The work of the laboratory during the year ended September 30, 1914, is reviewed. This included the analysis of 1,703 samples of miscellaneous foods, of which 1,279 were found to be legal, and of 294 samples of drugs, of which 281 conformed to existing standards. Sanitary inspections were made of 12,106 places, including grocery stores, meat markets, drug stores, bakeries, hotels, and restaurants, of which 50 per cent were found to be in good condition.

Special reports are given of a sanitary survey of canneries and bottling works operating in the State. Reprints are included of A Study of Fruit Jar Caps, by Gail M. Stapp (E. S. R., 32, p. 856), and The Effect of Bread Wrapping on the Chemical Composition of the Loaf, by H. E. Barnard and H. E. Bishop (E. S. R., 32, p. 354). Reprints of various instructions and notices issued by the food commissioner conclude the report.

Electric cooking in a cafeteria, B. E. HANNON (*Jour. Electricity*, 36 (1916), No. 15, pp. 280, 281, figs. 2).—The electric cooking equipment of a cafeteria is described in detail, cost data being included.

School lunches, CAROLINE L. HUNT and MABEL WARD (*U. S. Dept. Agr., Farmers' Bul. 712* (1916), pp. 27).—Although this publication was prepared primarily to furnish information regarding the foods best suited for the children's noon meal and for the school lunch basket, it emphasizes the fact that all three meals in a day's ration must be considered together and considerable space is devoted to the general food requirements of children. General information and suggested bills of fare are given for the home lunch, for the basket lunch, and for meals prepared at school. A few recipes for school-lunch dishes are included.

The child and its care, NEALE S. KNOWLES, LOUISE H. CAMPBELL, and MABEL C. BENTLEY (*Iowa State Col. Agr. Ext. Dept., Home Econ. Bul. 2* (1915-16), pp. 32, figs. 14).—Considerable information is contained in this bulletin regarding the diet of infants and of children three years of age or more, suggestive lists of foods and menus being included. Hints are also given regarding the personal hygiene and clothing of children.

The physiology of the newborn infant. Character and amount of the catabolism, F. G. BENEDICT and F. B. TALBOT (*Carnegie Inst. Washington Pub. 233* (1915), pp. 126, figs. 10).—In this publication the authors refer to earlier researches with newborn infants by other investigators and to the former paper by themselves (E. S. R., 32, p. 461). A translation is given of an article reporting respiration experiments with newborn infants, by K. A. Hasselbalch, who draws the conclusion that a well-nourished infant born at full term has a store of carbohydrates (glycogen) in its organs which is spent in the course of a few hours and that "the metabolism of a poorly nourished and premature infant depends chiefly on the oxidation of carbohydrates during the first hours of life." The conclusions of Hasselbalch are discussed by the authors in the light of other experiments.

The experiments here reported consist of observations of the metabolism of 105 newborn infants and include several hundred experimental periods. The technique employed is described in detail and the statistics of the observations are presented in tabular form.

An analysis of the data for the minimum metabolism periods shows that on the first day of life there are important temperature regulation disturbances which result either in a decreased metabolism, or an increased metabolism when there is an effort on the part of the infant to compensate for the loss of heat. After the second day there is a fair uniformity in the heat production

per square meter of body surface and a remarkable uniformity per square meter of body surface per unit of length. This constancy is such as to permit the establishment of a factor which indicates that when the square meter of body surface as computed from the body weight is divided by the length the metabolism per unit is 12.65 calories. From a study of the effect of temperature changes on the basal metabolism and the amount of available breast secretion in the first week of life, certain procedures for the conservation of energy and supplemental feeding are suggested.

Acceleration of growth after retardation, T. B. OSBORNE, L. B. MENDEL, EDNA L. FERRY, and A. J. WAKEMAN (*Amer. Jour. Physiol.*, **40** (1916), No. 1, pp. 16-20, pls. 2).—Curves are given illustrating the accelerated growth of a number of albino rats in which growth had previously been retarded either intentionally by the character of the diet or incidentally as the result of a failure on the part of the animals to eat enough or a supposedly adequate ration. The authors conclude that "after periods of suppression of growth, even without loss of body weight, growth may proceed at an exaggerated rate for a considerable period. This is regarded as something apart from the rapid gains of weight in the repair or recuperation of tissue actually lost. Despite failure to grow for some time the average normal size may thus be regained before the usual period of growth is ended."

Studies in water drinking.—XX, The relationship of water to certain life processes and more especially to nutrition, P. B. HAWK (*Biochem. Bul.*, **3** (1914), No. 11-12, pp. 420-434).—In this summary and digest of data, continuing previous work (E. S. R., 34, p. 763) the author describes the physiological needs of the body for water from both the physical and the chemical standpoints. With regard to water drinking at mealtime, he concludes that for the normal individual "the drinking of a reasonable volume of water with meals will promote the secretion and activity of the digestive juices, the digestion and absorption of the ingested food, and will retard the growth of intestinal bacteria and lessen the extent of the putrefaction processes in the intestine."

The relation of salivary to gastric digestion, L. A. I. MAXWELL (*Biochem. Jour.*, **9** (1915), No. 3, pp. 323-329; *abs. Jour. Chem. Soc. [London]*, **108** (1915), No. 637, I, p. 1024).—From the experimental data here reported, the author concludes in part that unboiled starch does not hinder peptic digestion, but that all cooked farinaceous foods do this unless first subjected to salivary digestion.

Gastrointestinal studies.—XII, Direct evidence of duodenal regurgitation and its influence upon the chemistry and function of the normal human stomach, W. H. SPENCER, G. P. MEYER, M. E. REHFUSS, and P. B. HAWK (*Amer. Jour. Physiol.*, **39** (1916), No. 4, pp. 459-479, figs. 12).—The experiments here reported were undertaken to determine whether or not duodenal regurgitation does occur, as evidenced by the presence of some of the constituents of the duodenal secretions in the samples of material removed from the stomach. Of these constituents, trypsin was regarded as the most satisfactory indicator. Quantitative determinations of trypsin were made in samples of the stomach contents, obtained by fractional removal through the Rehfuss tube as has been described in earlier papers of this series. The samples were taken after the introduction into the stomach of hydrochloric acid; vinegar; water; sodium bicarbonate solutions of various strengths; and a small Ewald meal, both with water and with sodium bicarbonate solutions. From the results of these tests which are reported in detail, the following conclusions are drawn:

"A tryptic enzyme is almost constantly present in the fasting and digesting contents of the normal human stomach. . . . [This] is deduced to be trypsin regurgitated from the duodenum."

"Trypsin in the gastric contents is highly resistant to the action of acid and pepsin. In general, trypic value is high in the presence of low acidity and in alkaline reaction, and of low value when the gastric contents are of high acid concentration. A fall in the acidity is usually accompanied by a rise in the trypic values.

"The color of the gastric contents often changes during the period of experiment from that of the ingested material to a golden yellow or a dark olive or blue green. This color change is due to regurgitation of bile from the duodenum and is absent on a diet of substances which do not cause the outpouring of bile. The trypic values in the gastric contents usually rise concomitantly with the color change, although in a non-bile stimulating diet the trypic value seems independent of the color.

"Sodium bicarbonate in 5 per cent solution is held in the stomach until sufficient hydrochloric acid is secreted to bring the alkalinity to a point where it is nonirritating to the duodenum. The retention is accompanied by a high trypsin value—suggesting antiperistalsis in the duodenum in response to an irritant. Sodium bicarbonate in 1 per cent solution hastens the emptying of the stomach either by increasing the motility of the stomach or opening the pylorus. Sodium bicarbonate solutions do not inhibit human gastric secretion, but seem to have a direct stimulatory effect in some cases.

"Free hydrochloric acid seems unnecessary for the opening of the pylorus, for the stomach sometimes empties while its contents are still alkaline. Fifteen-tenths per cent of hydrochloric acid ingestion is followed by a rapid fall in acidity to about 0.2 per cent, due to a regurgitation of alkaline duodenal contents, as is indicated by the rise in trypic values coincident with the fall of acidity. The acid is then emptied from the stomach.

"Regurgitation of duodenal contents into the stomach is but another of the protective functions of which the body furnishes so many examples and has for its purpose the defense of the small intestines from irritants."

An extended bibliography is appended.

For earlier work in this series see a previous note (E. S. R., 34, p. 659).

Green color in mother's milk after the ingestion of liver, E. FEER (*Biochem. Ztschr.*, 72 (1916), No. 5-6, p. 378).—In the case of wet nurses it was observed that the milk secreted a few hours after the ingestion of beef or calves' liver had a green color, which was noticeable on comparing it with normal milk. The condition persisted for about 16 hours. The suggestion is offered that the color is due to the presence of some derivative of the coloring matter present in the liver eaten.

Fasting studies.—XIV, The elimination of urinary indican during two fasts of over 100 days each, C. P. SHERWIN and P. B. HAWK (*Biochem. Bul.*, 3 (1914), No. 11-12, pp. 416-419).—In connection with previous studies of this series (E. S. R., 30, p. 765) two fasting experiments with a dog are reported. The fasting periods were 117 and 105 days in length, differing only in the fact that the 105-day fast was a "repeated" one.

During the initial fast of 117 days the indican output was continuous and fairly high throughout, while during the repeated fast of 105 days the indican values were much lower. On the basis of these observations, the authors conclude that "the finding of diminished intestinal putrefaction as a result of 'repeated' fasting is in line with other observations . . . which have shown that 'repeated fasting' is accompanied by greater resistance, a less rapid loss in body weight, less pronounced protein catabolism, and a general physical and mental improvement."

ANIMAL PRODUCTION.

Experiments on the Mendelian laws of inheritance, C. Puccetti (*Mod. Zootro, Parte Sci.*, 25 (1915), No. 4, pp. 145-153, figs. 6).—Gray Flemish rabbits and white Polish rabbits were crossed. In F₁ the gray color of the Flemish parent was dominant to the white of the Polish, but almost all the rabbits showed whitish spots. The F₂ generation consisted of 52 pigmented and 16 white individuals, thus following the Mendelian ratios. It appears that the self-colored individuals of the F₂ generation behave as heterozygotes and the white as homozygotes.

Rambouillet rams were crossed on Middle Tiber Valley ewes, which are noted for their very convex profile of nose and forehead, an open fleece, and the head, throat, belly, and limbs devoid of wool. In the F₁ generation all the crosses had a straight face profile. In the F₂ generation the convex profile appeared in ratio very nearly following Mendel's law. The extent of the fleece was greater in individuals with a straight profile, and seemed to follow, like the latter characteristic itself, the laws of dominance and of the numerical constancy of reversion.

Variability under inbreeding and cross-breeding, W. E. CASTLE (*Amer. Nat.*, 50 (1916), No. 591, pp. 178-183).—This paper comments on Walton's studies and conclusions (E. S. R., 34, p. 370). The author points out the utility value of both inbreeding and cross-breeding in securing variations, and shows that each has its utility at the proper time and place.

[**Mice breeding experiments,**] W. F. R. WELDON (*Biometrika*, 11 (1915), No. 1-2, App., pp. 60, pl. 1, figs. 7).—Complete data on mice breeding experiments are given.

The determination of sex, J. REGNAULT (*Compt. Rend. Assoc. Franc. Adv. Sci.*, 1914, pp. 554-557).—This is a short review of some of the principal theories on the determination of sex as applied to man, with special emphasis upon the influence of nutrition.

Duration of the spermatozoa after fecundation, in the pullet and the duck, A. CHAPPELLIER (*Compt. Rend. Assoc. Franc. Adv. Sci.*, 1914, pp. 519-526).—In his studies the author found that the extremes of duration of the spermatozoa after fecundation ranged from 10 to 18 days in the pullet and from 7 to 11 days in the duck. A bibliography of references on the subject is given.

The effect of castration on the weight of the pituary body and other glands of internal secretion in the rabbit, A. E. LIVINGSTON (*Amer. Jour. Physiol.*, 40 (1916), No. 2, pp. 153-185, figs. 8).—The author concludes as the result of his studies with rabbits that "there is no constant sex difference in the weight of the hypophysis. Neither males nor females show a constant hypophyseal hypertrophy following castration or spaying. The females may be regarded as showing a more constant response by the hypophysis after spaying than is to be seen among the males after castration."

"From the curves of growth corresponding to each group there is a constant relationship between the rate of increase in body weight and the response of the hypophysis to castration or spaying. There is less hypertrophy of the hypophysis in those groups which show an increase in rate of growth. In groups where no effect can be shown upon the rate of growth a distinct hypertrophy of the hypophysis is constant, though in no case is it very marked."

"A marked atrophy of the uterus follows removal of the ovaries from females. No change in the weight of the heart or the kidneys can be attributed to castration or spaying. No change can be demonstrated in the thyroid with the possible exception of a moderate decrease in males after castration. The

suprarenals show no marked effect. In the males a tendency toward enlargement follows castration, which does not appear after spaying females. No conclusions were reached as to the effect of castration or spaying on the thymus or pineal gland."

A bibliography of references is given.

Studies on the carotin group of the animal body.—I, Insecta, P. SCHULZE (*Sitzber. Gesell. Naturf. Freunde Berlin*, No. 1 (1913), pp. 1-22, pls. 3, figs. 3).—This reports a study of the chemical and physical nature and the physiological significance of the carotinoids in insects.

Studies of the carotin-xanthophyll group.—II, The carotin structure of the Chrysomelidae, P. SCHULZE (*Sitzber. Gesell. Naturf. Freunde Berlin*, No. 8-9 (1914), pp. 398-406, pls. 2).—This is a continuation of the above and treats of the physiological characteristics of the carotin-xanthophyll group as found in the Chrysomelidae. A bibliography is given.

The palatability of farm grasses, C. G. WILLIAMS (*Mo. Bul. Ohio Sta.*, 1 (1916), No. 3, pp. 70-72).—In two experiments to determine the palatability of various farm grasses 4 horses were fed from 18 to 20 lbs. of hay a day, one-half of the hay of each feed being timothy, and the remainder an equal weight of one of the other hays, a different one being tried each succeeding day. The timothy was placed in one end of the manger and the hay to be compared with it in the other end.

It was found that, in general, the mixed clover and timothy hay was more palatable than timothy or any other one grass. Brome grass stood second and timothy third. While the rye grasses (Italian rye and perennial rye) received high rank in the first test, they did not hold up as well in the second, and it is probable that their proper position is intermediate. Tall oat grass was decidedly inferior as regards palatability, with blue grass and redtop close seconds.

Kafir corn ("dari") from South Africa (*Bul. Imp. Inst. [No. Kensington]*, 13 (1915), No. 3, pp. 373, 380; *abs. in Analyst*, 41 (1916), No. 478, p. 8).—Analyses are given of various types of South African Kafir corn.

Comparative experiments with feed roots, 1912-1914, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. III (1915), pp. 25, figs. 2; *K. Landstr. Akad. Handl. och Tidskr.*, 54 (1915), No. 4, pp. 365-388, figs. 2).—Experiments were made with various feed roots during three years for the purpose of ascertaining their contents of dry matter. The roots under experimentation were 3 kinds of Bortfelder, 3 Yellow Tankards, and 2 Ostersund turnips; 3 kinds of Bangholm and 2 kinds of Swedish turnips; and the Barres and Eckendorfer fodder beets.

It was found that the various kinds of the same roots are quite similar in the amount of dry matter gathered from 1 hectare, as when one kind yields a greater percentage of dry matter another gives a greater yield of crop. The oblong Bortfelder and the Yellow Tankard turnips were superior to the white Ostersund, and among the beets, the Barres proved superior to the cylindrical Eckendorfer. In comparing the three kinds of roots, the Bortfelder, Yellow Tankard, and Ostersund turnips proved inferior in dry-matter content to the beets and Swedish turnips. The Swedish turnips gave best results in central, the beets in southern Sweden. The former developed better during the wet and cold season of 1912, while the beets gave better results during the dry and warm summer of 1914.

Value of blood and other offal for feeding purposes (*Wiener Landw. Ztg.*, 65 (1915), No. 38, pp. 310, 311, figs. 2; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 7, pp. 970, 971).—An appa-

ratus for the utilization of blood and other slaughterhouse offal as food for live stock is described.

The breeds of live stock, C. W. GAY (*New York: The Macmillan Co., 1916, pp. XVIII+483, pls. 16, figs. 99*).—This book, which is one of the Rural Text-book Series, treats of the various breeds of horses, cattle, sheep, goats, and swine.

Steer feeding, J. C. BURNS (*Texas Sta. Bul. 182 (1915), pp. 3-16, pls. 6*).—Five lots of 12 2-year-old Hereford steers were fed for 140 days the following daily rations per head: For the first 90 days, lot 1, 4.72 lbs. of cotton-seed meal and 48.52 lbs. of corn silage; lot 2, 9.45 lbs. of cold pressed cotton seed and 41.46 lbs. of corn silage; lot 3, 4.72 lbs. of cotton-seed meal, 35.23 lbs. of corn silage, and 6.86 lbs. of rice bran; lot 4, 4.72 lbs. of cotton-seed meal, 35.08 lbs. of corn silage, and 9.1 lbs. of ground milo-maize heads; and lot 5, 4.72 lbs. of cotton-seed meal and 48.52 lbs. of corn silage; and during the last 50 days, lot 1, 6 lbs. of cotton-seed meal and 50 lbs. of sorghum silage; lot 2, 12 lbs. of cold pressed cotton seed and 36.16 lbs. of sorghum silage; lot 3, 6 lbs. of cotton-seed meal, 34.66 lbs. of sorghum silage, and 7.56 lbs. of rice bran; lot 4, 6 lbs. of cotton-seed meal, 32 lbs. of sorghum silage, and 12 lbs. of ground milo-maize heads; and lot 5, 6 lbs. of cotton-seed meal and 50 lbs. of sorghum silage.

These steers made, for the entire period of 140 days, average daily gains per head of 1.94, 2.15, 2.27, 2.44, and 2.07 lbs., at a cost for feed of 7.52, 8.3, 8.09, 9.2, and 7.05 cts. per pound of gain for the respective lots. The average net shrinkage in shipping was 7.6, 5.3, 5.65, 5.53, and 7.16 per cent for the respective lots, while the dressing percentages were 56.59, 57.05, 58.04, 58.46, and 56.55. The net profits per steer were \$1.24, \$1.90, \$3.44, \$0.34, and \$1.18 for the respective lots.

Hogs were placed in several of the pens, but the results indicate that there is danger of loss in having them follow cattle that are receiving full rations of cotton-seed meal. Previous tests indicate, however, that they may follow, with a fair degree of safety, cattle that are receiving only enough cotton-seed meal (from 3 to 4 lbs. for each 1,000 lbs. of live weight per day) to balance their ration.

It is stated that, based on the selling prices of 7.35 cts. per pound for lot 1 and 7.5 cts. for lot 2, cold pressed cotton seed could have cost \$23.90 a ton and proved of equal value to cotton-seed meal at \$28 a ton. Rice bran at \$16.70 a ton proved profitable in supplementing cotton-seed meal and silage and was more profitable for this purpose than ground milo-maize heads at \$20 a ton. In fact, based on the selling prices of 7.65 cts. per pound for lot 3 and 7.75 cts. for lot 4, rice bran could have cost \$22.92 a ton and proved of equal value to the ground milo-maize heads at \$20 a ton. It was very evident that the milo-maize heads, which contained about 75 per cent grain, were much more palatable than the rice bran. When the latter is used it is deemed very important that it be fresh and of good quality and that it be fed during the fall and winter months. During warm weather it becomes rancid very quickly and in such condition cattle do not relish it and it deteriorates in feeding value.

Based on the final weight at Fort Worth, lot 5, that had had access to a shed open on the south side, gained 23 lbs. a head more than lot 1, fed in a similar pen without shelter, both having received the same kind and amount of feed. Had lot 5 sold for 7.35 cts. per pound as did lot 1, there would have been a difference in profit in its favor of \$1.40 a head.

The results of the experiment indicate that "without a greater margin or spread between the prices for feeders and the prices for fat cattle than was had in this case, there is practically no direct profit in feeding cattle with feeds at the prices herein quoted."

Relation of steer feeding to farm returns, C. A. WILLSON (*Tennessee Sta. Bd. 114 (1915)*, pp. 79-110, figs. 6).—This is a restatement and continuation of work previously noted (E. S. R., 20, p. 665). The primary object of these experiments was to determine the amounts of beef that an acre of land would produce if the crops grown upon it were fed to live stock.

Seven 1-acre plats of the following crop rotations were grown, as follows: Plat 1, soy beans and barley; plat 2, cowpeas and barley; plat 3, corn and barley; plat 4, soy-bean hay and barley; plat 5, soy beans and wheat; plat 6, soy-bean hay and oats; and plat 7, alfalfa. During seven years, from 1908 to 1914, inclusive, the average annual beef production per acre was 508, 451, 434, 435, 402, 456, and 515 lbs., for the respective lots.

The experiments indicated that better results in beef production can be secured from the rotation of soy beans and barley than from any other combination of crops tested. The alfalfa acre ranked first in yield of beef for three years and last for one year. In beef yield it was the ranking acre, but has not been on experiment so long as some of the others. The soy-bean and barley acre ranked ahead of it in gross returns per acre, being first for two years, second for two years, never lowest, and for five of the seven years among the upper half of the acres in beef production. Oats and soy-bean hay have been on experiment for only four years, and although they have made a good showing for that time not enough results have been obtained to warrant the drawing of conclusions. The cowpea and barley acre has not averaged so well as the soy-bean and barley acre. It has never ranked first in production, but has, however, for three years produced more than 500 lbs. of beef per acre. The corn and barley acre thus far has proved to be nearly the poorest of the acres for the production of beef, ranking five years out of the seven in the lower division. The use of corn and barley as a rotation for the growing and finishing of beef cattle is not recommended as compared with soy beans and barley.

The beef produced was valued at 6 cents per pound, the silage fed at \$3 per ton, and it was assumed that there would be a margin of \$1 on 1,000-lb. steers for the 60- to 90-day feeding period. On this basis it is calculated that the gross returns per acre were \$61.23, \$58.94, \$56.92, \$57.07, \$55.99, \$59.23, and \$58.91, for the respective lots.

These experiments were so conducted as also to determine whether it would be better to feed the crops grown in a short feeding period with a heavy ration, or to feed a lighter grain ration and thus extend the time for finishing. When fed for 90 days on the lighter grain ration the average gain per acre was 584, 447, 527, 492, 554, 570, and 515 lbs. for the respective lots, while when fed for 60 days on a heavy ration the average gains per acre were 375, 453, 301, 277, 417, and 417 lbs. for the respective lots. The steers on the 90-day feed made 33 per cent larger gains than the steers on the 60-day feed, owing to a greater utilization of the roughages grown on each acre. Also the increased finish which the steers on 90-day feed put on would probably make them bring from 0.25 to 0.5 ct. more per pound than the steers on 60-day feed.

Data on the prices obtained for grains and hay by marketing through steers by the foregoing methods are given, also the prices the grains must sell at when not fed to make up for fertility returned by steers when fed.

Profits and losses in cattle feeding (*Wallace's Farmer*, 41 (1916), No. 10, p. 398, fig. 1).—A chart is given which shows the relation over a long period of years between cattle and corn prices. During 1914 and 1915 cattle lost money to the average feeder. During January, 1916, the loss was about \$13 per head and during February about \$12. Better conditions for the near future are indicated.

Calf-feeding experiments (*Agr. Gaz. [London]*, 83 (1916), No. 2201, pp. 151, 152).—In experiments conducted at the college farm at Kilmarnock, Scotland, one lot of 4 calves was fed on new milk, the actual quantity of whole milk consumed being equivalent to an average of 1.75 gal. per calf per day over the whole experimental period. Hay was fed ad libitum from the time the calves were six weeks old, and linseed cake was introduced when the calves were eight weeks old. In one trial the calves made an average weekly gain per calf of 14.8 lbs. for the 16-week period, while in a second trial they made 12.6 lbs.

Another lot of calves, which were fed whole milk for the first four weeks and then gradually changed to a ration consisting of an average of 2 gal. of separated milk and 0.75 lb. of crushed oats, together with hay and linseed cake, made during one trial an average weekly gain of 12.7 lbs. per head and during a second trial 12.1 lbs. A third lot of calves which were fed an average of 2 gal. of separated milk and 0.5 lb. of maize meal per calf per day, together with hay and linseed cake, made average weekly gains of 12 lbs. per head during one trial and of 12.1 lbs. during a second trial.

A fourth lot of calves was fed an average of 1.75 gal. of whey and 2 lbs. of calf meal per calf per day. The calves did not care for the whey and it had a tendency to scour them. These calves made an average weekly gain of 9.5 lbs. per calf during one trial and of 9.7 lbs. in a second trial. This ration was in no way as satisfactory as the others.

Excellent results were obtained from the separated milk with either crushed oats or maize meal, fed as gruel, and it is stated that if separated milk is available it is doubtful if anything better is needed.

Methods of handling sheep in California, F. A. ELLENWOOD (*Nat. Wool Grower*, 6 (1916), No. 1, pp. 19-22).—Results of experiments are given which show more rapid gains by hot-iron docked lambs than by knife docked lambs.

Lambing methods in national forests of Southwest, R. R. HILL (*Nat. Wool Grower*, 6 (1916), No. 3, pp. 7-10, figs. 2).—The author compares the open-range and the pasture and corral methods of lambing.

It has been found that the open-range method of lambing is not economical on the mountain ranges of the national forests in the Southwest. The best method of lambing is, theoretically, in coyote-proof pastures, but in practice the best method to adopt on the average allotment in the Southwest is to lamb in corrals and pastures in connection with the open range. The advantages of the improved methods of lambing over the open-range method are (1) an increase of from 3 to 7 per cent in the number of lambs secured; (2) improved conditions for the development of the lamb during the most critical period of its life; (3) a net saving of approximately 20 cts. per head on the ewes to lamb; and (4) the protection of the season's growth of forage, insuring that it will be available for lambing when needed.

The cost of constructing all improvements necessary for lambing a band of 1,000 ewes should not exceed \$1,000. The amount of range required for such a band during the five-week lambing period would vary from 3 to 5 sections, according to the character of the forage and the general topography. The number of acres that should be inclosed would vary from 140 to 200 acres. The pasture and corral method of lambing is well adapted to any sized outfit and to any ordinary type of range commonly used for lambing in the Southwest.

Improved management of national forest stock, W. C. BARNES (*Nat. Wool Grower*, 6 (1916), No. 1, pp. 23-27).—This is a discussion of some of the principal problems which have been investigated by the grazing division of the Forest Service of the U. S. Department of Agriculture. It includes the open herding system of sheep grazing, pasture and sheds for range lambing, grazing

sheep without water, deferred and rotation grazing, and general improvement of the grazing areas.

Corriedale sheep record association (*Breeder's Gaz.*, 69 (1916), No. 7, p. 374).—Announcement is made of the organization of the American Corriedale Association. This association will maintain a flock book for all Corriedale sheep tracing in an unbroken line through both parents to Corriedale stocks recognized by the Sheep Breeders' Association of New Zealand.

A demonstration test of swine rations (*Breeder's Gaz.*, 69 (1916), No. 5, p. 243, fig. 1).—In a demonstration test at the Indiana Experiment Station showing the value of supplementary corn for fattening hogs, 2 hogs from each of 3 lots of 10 79-lb. pigs were butchered after a 70-day test and the carcasses displayed. Lot 1, receiving corn alone, averaged during the 70-day period 20 lbs. gain per head, costing 8.64 cts. per pound of gain; lot 2, on corn and tankage, 94 lbs. gain, costing 3.92 cts. per pound; and lot 3, on corn and buttermilk, 128 lbs. gain, costing 4.08 cts. per pound.

Clover meal as a feed for swine, A. ZUR HORST (*Deut. Landw. Tierzucht*, 20 (1916), No. 2, pp. 10-12).—A ration composed of clover meal, potatoes, meat meal, acorns, and beets proved a very satisfactory feed for fattening swine.

A study of hog profits and losses (*Wallaces' Farmer*, 41 (1916), No. 5, p. 155, fig. 1).—A graphic illustration is given of the fluctuation of hog prices over a period of twelve years, with the corresponding profit or loss to the producer.

Meat and blood meal as a supplement to oats for horses, WESTMATTELMANN (*Deut. Tierärztl. Wochenschr.*, 24 (1916), No. 8, pp. 69, 70).—Successful trials in feeding 10 lbs. per day per horse of a mixture of 20 lbs. of dried stomach contents, 20 lbs. of blood, 20 lbs. of meat meal, 2 liters of brewery yeast, 7 lbs. of sugar, 1 lb. of salt, and 30 lbs. of oats are reported. It took several weeks for the horses to become accustomed to the feed, but after this time they put on weight and muscle. A ration composed of 2 lbs. of meat meal, 2 lbs. of oats, 3 lbs. of sugar, and 3.5 lbs. of bran per head per day also gave satisfactory results.

Breeding and training of the horse, G. BONNEFONT (*Élèrage et Dressage du Cheval*. Paris: J. Bailliére & Sons, 1914, 2. ed., pp. 446, figs. 228).—This book treats of the breeding and management of the various breeds of light and draft horses and of their training for harness, draft, and army purposes.

Mechanics applied to the race horse, H. COUSTE, trans. by E. B. CASSATT (New York: 1916, pp. 80, pl. 1, figs. 10).—This is a translation of the second edition of this work and treats of the conformation of the race horse and the mechanics involved in the various gaits and in jumping.

The sensation of the Percheron world (*Breeder's Gaz.*, 69 (1916), No. 6, pp. 309, 310, figs. 2).—An account of the recent deal in which a half interest in the 11-year-old Percheron stallion Carnot is reported to have been sold for \$20,000. The history of this well-known stallion is given.

The Missouri Poultry Experiment Station, T. C. PATTERSON (*Breeder's Gaz.*, 69 (1916), No. 7, pp. 367, 368, figs. 10).—A discussion of the situation, equipment, and work of the Missouri State Poultry Experiment Station, at Mountain Grove, Mo.

From observations for several years of egg-laying contests the author believes that more depends on the strain than on the variety, for it is not uncommon with two pens side by side of the same variety for one to average perhaps 180 eggs per hen, while the other pen averages only 80 or 90 eggs. The difference seems to be that one man has carefully selected and bred for egg production, while the other has not. Another point of importance is the uniformity of size, shape, and color of the eggs. The strain seems to influence his as much as the number of eggs produced.

Contrary to popular belief, the heaviest layers were the lightest eaters, and the hen laying the greatest number of eggs consumed the smallest amount of feed. It seems to be the hen's ability to utilize the feed she eats as much as the quantity eaten. The balancing of the ration also evidently has much to do with egg production.

It has been found that the color of a fowl does not influence egg production. One Buff Leghorn pullet laid more than 200 eggs in one year—more than all others in her class. The week before the contests began she was entered in a poultry show and was the highest-scoring bird in her class. One reason for the belief that high-producing hens are rough and ugly is that they usually are viewed and pictured after the year's work is done. At the beginning of the contest many of the high producers were high-scoring.

It is stated that the popular theory that the larger birds lay large eggs is incorrect. Where all the eggs were weighed it showed that the Ancona, which is smaller than the Leghorn, laid the largest egg of all the breeds tested. Another theory is that the medium-sized or all-purpose breeds do not lay as many eggs as the egg breeds, like the Mediterraneans. One reason given is that the all-purpose breeds lose time brooding, but the records show that the Wyandottes laid the greatest number of eggs and also went broody the greatest number of times.

Can selection cause genetic change? W. E. CASTLE (*Amer. Nat.*, 50 (1916), No. 592, pp. 248-256).—This is a continuation of the discussion previously referred to (E. S. R., 34, p. 564) on fecundity in the domestic fowl and the selection problem.

* A feminized cockerel, H. D. GOODALE (*Jour. Expt. Zool.*, 20 (1916), No. 3, pp. 421-428, figs. 7).—A Brown Leghorn chick was castrated by making an incision on each side and carefully removing the testes. Particular care was taken to see that all testicular matter was removed. Just previous to the operation on this bird the ovaries had been removed from two pullets of the same strain belonging to the same brood and placed in moist cotton. They were cut in several pieces and dropped into the abdominal cavity of the cockerel on each side. No attempt was made to suture the pieces in place.

The bird developed a general feminine appearance except that it grew somewhat long-legged and rangy, as a cockerel would do. The spurs remained undeveloped a long time. When the adult plumage came in it lost some of its nondescript character and in most sections was clearly that of the normal female. The chief difference lay in the feathers of the dorsal regions, which were black with relatively few minute brown spots instead of the uniform mixtures of minute dull black and brown spots characteristic of the Brown Leghorn female.

Later the bird was killed and the autopsy showed the following findings: Weight, 3 lbs. 7 oz.; oviduct not found, nor were vasa deferentia; spleen hypertrophied; very little body fat; bursa fabricii not found. Ovarian tissue was found in the following positions: On the left side one piece was attached to the body wall, ribs, and transverse septum and inclosed in a serum-filled sack. The ova were very small, not more than a millimeter in diameter. A second mass lay on the surface of the kidney just lateral to the junction of the iliac with the vena cava. Four of the pieces placed on the right side were found to have become attached, three of them in the form of elongated masses, one attached to the ribs, another to the transverse septum and liver, while the third was attached to the mid-dorsal mesentery at the level of the adrenal. The fourth had adhered to the outer body wall. Some of the ova on this side reached 3 mm. in diameter. There were no evidences of empty follicles. The blood supply of the pieces of ovum on this side was well developed.

It is the opinion of the author that "the difference between the secondary sexual characters of the sexes can not be ascribed solely to the internal secretions, but that the genetic basis of each character must also be taken into consideration. At least four groups of characters can be recognized: Head furnishings, dependent in the male upon the testes, in the female independent of the ovary in certain respects, in other respects dependent; spurs independent of testes, but on which the ovary exerts an inhibition, often incomplete; voice and behavior, which in the male is partially dependent and partially independent of the testes, yet closely correlated with these; and plumage, which is independent of the male organs, but on which the ovary exerts a modifying influence.

"Since the male may be feminized, it follows that if the ovary be considered an inhibitor merely, then the male must possess both potentialities for the secondary sexual characters and that the ovarian secretion suppresses the male character, allowing the female plumage to develop. Genetically, then, the male secondary sexual characters must be considered dominant to the female. On the other hand, if the ovarian secretion be considered a modifier, transforming the male character into the female, we need not assume that both potentialities exist in the male, but only the one. We may also make a similar assumption for the normal female. At present it is impossible to determine whether or not the ovarian secretion is an inhibitor or modifier."

The feeding of young chicks on grain mixtures of high and low lysin content, G. D. BUCKNER, E. H. NOLLAU, and J. H. KASTLE (*Kentucky Sta. Bul. 194* (1916), pp. 3-21, figs. 16; *Amer. Jour. Physiol.*, 89 (1915), No. 2, pp. 162-171, pl. 1).—Two lots of chicks were fed eight weeks, lot 1 receiving a mash twice a day, morning and evening, consisting of equal parts by weight of finely ground wheat, wheat bran, sunflower seed, and hemp seed, moistened with sour skim milk, and once a day at noon they were given a coarsely-ground grain mixture of wheat, hemp seed, and cracked corn. Lot 2 received a mash consisting of finely-ground barley, rice, hominy, and oats, 100 gm. each, and 56 gm. of gluten flour, and prepared with protein-free milk, and at noon a mixture of equal parts of barley, rice, and hominy. The lysin content of the ration fed to lot 1 was 3.8 per cent of the total nitrogen for the mash and 2.23 per cent for the grain; lot 2, 0.5 per cent for the mash and 0.79 for the grain.

Five of the chickens of lot 1 at the conclusion of the experiment weighed 2,538 gm., whereas 7 chickens in lot 2 weighed 1,195 gm. There were marked differences in the feathering of the two lots of chickens, lot 1 showing the feathering characteristic of the mature chicken, whereas lot 2 still showed the feathering of the young and immature chick at the conclusion of the experiment. Great difference in the two lots of chickens was also shown in their general activity during the progress of the experiment, the chickens of lot 1 being greatly more active than the chickens of lot 2. It was also observed that the chickens of lot 2 consumed more charcoal than the chickens of lot 1.

It is stated that the desire showed by the young chick for hemp seed is remarkable. It has been observed that out of a grain mixture containing this material they will pick out every hemp seed before eating the remainder of the ration. Of all the substances used in the feeding experiments hemp seed is richest in lysin.

The lots were then reversed, the chickens of lot 2 receiving the ration of lot 1 and lot 1 the ration of lot 2. At the end of a week the chickens of lot 2 were found to weigh 1,539 gm., an increase in seven days of 41.2 gm. per chick, as compared with an average gain per week of 15.9 gm. during the regular period of the experiment. It is stated that this rapid increase in

weight indicates that while growth was stunted on the first ration the chickens still possessed the power to grow rapidly on the ration of lot 1. The difference in the nutrition in these two lots of chicks is deemed due, in all probability, to the difference in the amount of lysin received by the two lots, and possibly to a difference in the quantity and nature of the fats contained in the two rations. The mash fed to the chicks of lot 1 contained 13.08 per cent of fat, and the dry grain mixture 8.21 per cent, whereas the mash fed to the chicks of lot 2 contained only 1.8 per cent of fat and the grain mixture 1 per cent.

In order to determine to what extent the difference shown by the two lots was due to difference in the protein or fats two lots of chicks were fed for 60 days the same rations as in the foregoing experiment except that to the ration supplied to lot 2 there was added sufficient butter fat to bring the fat content up to that of the ration fed to lot 1. The chickens of lot 1 showed an average gain per chick of 277.3 gm. over the chickens of lot 2. The differences shown by these two lots of chicks at the end of the feeding period were very striking. The chickens of lot 1 were strong, growthy, and perfectly feathered in contrast to the chicks of lot 2, which, although in perfect health, were markedly stunted in their growth and showed the feathering characteristics of a much younger chick and the yellow color and appearance of the newly-hatched chick about the head and neck. The external sexual characteristics of these two lots also showed most striking differences. In lot 1 the cockerels were easily distinguished from the hens and both showed well-developed, highly colored gills and combs, whereas the chicks of lot 2 showed no well-developed external sexual characteristics whatever, the combs of both sexes being rudimentary and colorless.

These two lots were reversed, as in the first experiment, and the average percentage gains of lot 1 were 5.1 against 28.9 for lot 2. Within one week after reversing the rations fed to lots 1 and 2 the external sexual characteristics of the chicks of lot 2 became noticeable, and at the end of three weeks were very pronounced.

It is deemed evident from these results that the marked differences shown by these two lots of chicks in the rate of growth and development can no longer be ascribed to the fat content of the two rations, but rather to differences in the amino-acid content of the two rations and in all probability to difference in the lysin content.

When to feed the baby chick, B. F. KAUPP (*North Carolina Sta. Bul. 235 (1916)*, pp. 13-15, figs. 7).—Studies were made to determine how much of the abdominal yolk was absorbed in the embryonic stage in the shell, or in other words, to determine how much food was left in the abdominal yolk at hatching.

The weights were taken of 1,454 White Leghorn eggs, the average being 57.7 gm. By boiling the egg and weighing it was found that the average weight of 10 yolks was 17.75 gm. In a study of ten baby chicks that had started to pip out of the shell but had died, it was found that the unabsorbed yolk weighed, on an average, 8.5 gm., or 47 per cent unabsorbed. There appeared to be no constant definite weight of the amount of yolk left in the yolk sac unabsorbed at this period of the chick's life. The weights varied from 8 to 10 gm., and it was found that the rate of absorption of the yolk varied in different individuals.

Forty chicks were killed by the aid of chloroform at different ages, skinned, and the carcasses immediately placed in a 10 per cent solution of formaldehyde. Later these carcasses were sectioned longitudinally for the purpose of making a study of the relation of visceral organs with respect to the abdominal yolk sac.

From this study it was concluded that nature has made ample provision in supplying a generous store of food to keep the baby chick well nourished until the brood has hatched, and that this supply of nutrients is sufficient to carry nutrition on until the bird becomes strong. "From the study of the rapidity of absorption of the abdominal yolk it appears clear that if baby chicks be fed as soon as hatched there is likely to be trouble. If the stomach, gizzard, and intestines become gorged with food it is certain to place more or less pressure on the abdominal nerves and blood and lymph vessels, and thus the function of these vital structures will be interfered with and in some cases cause death."

Five experiments were run in which the baby chicks were left in the nursery tray until they were 72 hours old. They were then placed in outdoor brooders and given nothing but buttermilk to drink for the next 24 hours, and during the next 24 hours (the fifth day) were given only two light feeds with the milk. On the sixth day they were placed on full feed. These chicks thrived better and were stronger and more resistant to chick troubles than their controls.

It is suggested that in the case of sitting hens it is advisable to give milk the first day after taking the hen from the nest and light feed for the next two days, after which the chicks may be placed on full feed with safety.

By using the combination sitting and brooding coops the hen may be fed from a high can, such as an oyster can, and the baby chicks fed in their compartment, as desired and without being interfered with by larger fowls or the mother.

Poultry raising in Wisconsin, J. G. HALPIN and J. B. HAYES (*Wisconsin Sta. Bul.* 261 (1916), pp. 3-35, figs. 13).—A popular discussion of methods of poultry raising under Wisconsin conditions.

Ostrich breeding, A. SOKOLOWSKY (*Berlin. Tierärztl. Wochenschr.*, 32 (1916), No. 4, pp. 37-41, figs. 3).—Methods of breeding, feeding, care, and management of ostriches in German Southwest Africa are described.

A successful experiment in skunk farming, H. D. JONES (*Sci. Amer.*, 114 (1916), No. 14, pp. 346, 366, figs. 5).—An account of methods adopted in conducting a skunk farm as a profitable business enterprise.

DAIRY FARMING—DAIRYING.

Feeding experiments with dairy cattle, H. GOLDSCHMIDT (*Tidsskr. Landökonomi*, No. 4 (1915), pp. 180-196; abs. in *Zentbl. Agr. Chem.*, 44 (1915), No. 7, pp. 334-336).—This article reports experiments in the economical feeding of dairy cattle in Denmark, in which the value of oil cake, molasses feed, beets, and straw was demonstrated.

The utilization of beets in cattle feeding, L. MALPEAUX (*Vie Agr. et Rurale*, 6 (1916), No. 2, pp. 27-33, figs. 4).—In feeding experiments with dairy cows it was found that the feeding of whole beets produced a somewhat larger yield of milk and milk fat than when chopped beets were fed, this increase probably being due to more complete mastication and utilization.

The utilization of cassava flour in the feeding of dairy cattle, J. E. LUCAS (*Bul. Econ. Gouvt. Gen. Madagascar*, 15 (1915), I, No. 1, pp. 67-71).—The partial substitution of cassava flour in the ordinary grain ration for dairy cattle resulted in an increased milk and milk fat yield and in a greater live weight of the animals so fed.

The value of cod liver meal as a dairy cattle feed, H. ISAACHSEN, E. FRIDRICHSEN, A. LALIM, and INGEBORG K. WOLD (*Ber. Foringsförsok Stat. [Norges] Landbrukskole*, 9 (1913-14), pp. 1-52, figs. 5; abs. in *Zentbl. Agr. Chem.*, 44 (1915), No. 7, pp. 330-333).—The composition of cod liver meal is given as dry matter 92.53, protein 50.69, fat 31.43, ash 2.52, and other constituents 7.89

per cent. The feeding of this material to dairy cattle resulted in increased milk and fat yields.

The feeding of sesame cake to dairy cattle, R. GIULIANI (*Ann. Ist. Agr. [Milan]*, 12 (1913-14), pp. 1-69).—Experiments in the feeding of sesame cake to dairy cattle resulted in increased milk and fat yields. Butter was produced sooner and at a lower temperature from cream from cows fed sesame cake than from those fed linseed cake. The Polenske and Reichert-Meissl numbers were lowered.

The work of the agricultural colleges and experiment stations in its relation to a better milk supply, W. A. STOCKING (*Milk Dealer*, 5 (1916), No. 6, pp. 20-23, fig. 1).—This paper has been previously referred to (E. S. R., 33, p. 702).

Data collected in inspection work in Ithaca, N. Y., are presented. It is shown that at the beginning of the inspection work in 1907, 98 farmers were producing milk for the city. Of this number, 31 had milk houses, 4 used a small-top milk pail, and 1 used a damp cloth for wiping the udder just before milking. In 1914 there were 124 producers, of whom 62 had suitable milk houses, 60 used small-top milk pails, and 12 used a damp cloth. During all this period, it has been the purpose of the inspectors to give as much assistance as possible, both to producers and dealers, and improvements made are attributed to friendly cooperation and assistance.

Milk and cream contests, E. KELLY, L. B. COOK, and J. A. GAMBLE (*U. S. Dept. Agr. Bul. 356* (1916), pp. 23).—The subjects discussed in this bulletin are national contests, how contests are conducted, educational features, exhibitions, average scores of recent contests, and benefits of milk contests to dairymen. Suggestions are given for the production of contest milk.

[**Use of milk and milk products**] (*Cong. Rec.*, 53 (1916), No. 87, pp. 6039-6042).—This reviews statements from various dairy experts, agricultural authorities, farm journals, and newspapers on the condition of the milk supply in this country and the need for more effective inspection and legislation.

Experiments in pasteurizing milk by means of the "universal pasteurizer" in Denmark, A. V. LUND (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg [Copenhagen]*, 86 (1914), pp. 56-72, fig. 1; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 986-988).—In Denmark, under the law dealing with the combating of tuberculosis in domestic animals, the pasteurization is obligatory of all skim milk and butter-milk given to cattle, so that it gives a negative reaction to Storch's test (E. S. R., 10, p. 384); i. e., the milk must be heated to at least 80° C. The apparatus often used is the so-called "universal pasteurizer," a regenerative heating apparatus in which the milk, after being heated, is cooled before leaving the pasteurizer.

In experiments it was found that if the milk from an ordinary pasteurizer has, on reaching the weighing receptacle, a temperature that would allow a positive reaction to Storch's test, the capacity for such reaction can be neutralized by the subsequent admission into the vessel of superheated milk. This, however, can not happen if the milk comes from the "universal pasteurizer" or similar apparatus, hence if milk capable of giving a positive reaction enters the weighing receptacle it retains that capacity in spite of any subsequent rise, however great, in the pasteurizer itself. The reading of the thermometer on the "universal pasteurizer," taken at the same time as the sample, thus affords no evidence as to how the milk in the weighing receptacle will react. A relatively small quantity of milk capable of positive reaction can, when added to the milk in the weighing receptacle, cause the latter to react.

Hence, as mixing is continually taking place, the milk in the receptacle can give a positive reaction a considerable time (even several hours) after the actual milk capable of causing the reaction has emerged from the pasteurizer.

As the various milk particles probably have somewhat different temperatures when they reach the top of the "universal pasteurizer," and the thermometer can only register one temperature at a given moment, the latter must always be higher than the critical temperature of the reaction (from 80° to 81°) in order that the least warmed particles of the milk, and consequently the whole bulk of the milk, shall not give a positive reaction. For this reason the maker now makes a point of mentioning in the directions for using his apparatus that the thermometer should always register at least 83° if the milk is to pass Storch's test. It is thought that this precaution will be all that is needed, and the working of the machine is not affected thereby. The rapidity with which the milk cools after being heated seems to have no effect upon its reactive capacity.

The milk of Jersey cows and of goats behaved in a precisely similar manner to that of Danish cows in respect to its reaction to the Storch test.

The control of the degree of acidity, the catalase, and the reductase by biorization, W. D. KOOPER (*Molk. Ztg. [Hildesheim]*, 29 (1915), Nos. 76, pp. 959-961; 77, pp. 973, 974).—Data are presented which indicate that biorization materially reduces the formation of acid in milk, destroys bacteria, and improves the keeping quality of milk.

Experiments in cheese making from milks of different fat contents, A. V. LUND (*Ber. K. Vet. og Landbohøjskoles Lab. Landøkonom. Forsøg [Copenhagen]*, 88 (1914), pp. 73-87; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 988-990).—In cheese investigations it has been found that the coefficient of the cheese, i. e. the relation between the fat content and the casein content, can be very accurately estimated from the fat percentage of the "cheese milk" and, conversely, that the fat percentage can be calculated from the coefficient. The factor to be used in the case of the milk of ordinary Danish cows is 37.5.

It follows that the coefficients of the different kinds of cheese known commercially as whole-milk cheese, half and quarter whole-milk cheese, and skim-milk cheese are sufficiently distinct to allow of the various kinds being distinguished by this means. In spite of the very considerable variations in the values of the same sort of cheese it has been found that the minimum values found for whole-milk cheeses are higher than the maximum values for half whole-milk cheeses, while the minimum values for the latter are in their turn higher than the maximum values of quarter whole-milk cheese, and so on. Such factors as whether the cheese is made with pasteurized or unpasteurized milk, and whether the curd is coarsely or finely divided, exert some influence upon the coefficient of the cheese, but not to the extent of appreciably modifying the above conclusions.

The coefficients remain almost the same whether the cheese analyzed is fresh or has been kept some time. The method of storing also has little effect upon the coefficients as determined by analysis. As the coefficients determined by the experiments are merely experimental figures, and do not correspond to the conditions obtaining in practical cheese making, in trade, or at exhibitions, they can not be used as type values, but may serve as guides for the determination of the latter.

The yield of cheese can be roughly estimated when the amount of fat and casein in the cheese milk is known. Cheeses made from the milk of Jersey cows were found to have higher coefficients than those made from the milk of

ordinary Danish cows; yet the coefficients of the former were relatively too low, owing to the large amount of casein in the milk of Jersey cows. In the case of the milk of the Jersey cow the factor 37.5 given above must be replaced by the factor 30. The milk of Jersey cows gave a much larger cheese yield than ordinary milk, this being due to the larger fat and casein content of the former. Judging from a single examination there is no characteristic difference between the quality of cheese made from the milk of Jersey cows and that made from the milk of ordinary Danish cows.

Any given cheese milk can be altered by the addition of skim milk or whole milk (or even cream) in such a way as to obtain the desired coefficient in the cheese to be produced.

VETERINARY MEDICINE.

Lymphatic glands in meat-producing animals, P. GODBILLE, trans. by A. F. LIAUTARD and D. A. HUGHES (New York: William R. Jenkins Co. [1915], pp. 175, figs. 17).—The first part of this work (pp. 17-109) deals with the topographic anatomy of the lymphatic glands in food-producing animals, including cattle, swine, sheep, and horses, and the second part (pp. 111-164) with the normal appearance of these glands in meat-producing animals and the pathological alterations occurring in them.

A practicum of bacteriology and protozoology.—I, Bacteriology, K. KISS-KALT (*Praktikum der Bakteriologie und Protozoologie. I, Bakteriologie*. Jena: Gustav Fischer, 1914, 3. ed., pp. VIII+112, figs. 40).—The third edition of the first part of this compend, previously noted (E. S. R., 26, p. 882).

Yearly reports in regard to the progress made in veterinary medicine, edited by W. ELLENBERGER, W. SCHÜTZ, and O. ZIETZSCHMANN (*Jahresber. Vet. Med.*, 33 (1913), pp. V+423; 34 (1914), pp. VII+297).—These reports covering the years 1913 and 1914 are in continuation of that previously noted (E. S. R., 29, p. 581).

Wound treatment, L. A. MERILLAT, E. W. HOARE, ET AL. (*Chicago: Amer. Jour. Vet. Med.*, 1915, pp. 186).—This work consists of articles on wounds and wound treatment by a number of authors.

Antiseptic methods employed in the treatment of infected wounds based on a bacteriological examination of the pus, CAZIN and MILLE. S. KRONGOLD (*Compt. Rend. Acad. Sci. [Paris]*, 162 (1916), No. 2, pp. 89-91).—In the treatment of wounds, in which *Bacillus pyocyaneus*, staphylococcus associated with various diplococci, and other common bacteria were found, a solution of silver nitrate (1:200,000) yielded the most satisfactory results. For suppurative, gangrenous wounds in which *B. perfringens*, tetragnenes, anaerobic streptococci, *B. coli*, and others were found, hypochlorite solutions were necessary. The solutions used were those prepared according to Dakin's method and the water of Javelle. The latter gave the best results in a concentration of 15 gm. per liter of distilled water, stronger solutions being found to produce irritation of the skin after prolonged use. Dakin's hypochlorite solution was not as strongly bactericidal as the water of Javelle, but does not irritate the skin and can be used continuously for several weeks. Favorable results are also reported with the polyvalent serum of Leclainche and Vallée.

The germicidal power of glycerin on various micro-organisms under various conditions, E. H. RUEDIGER (*Philippine Jour. Sci., Sect. B*, 9 (1914), No. 6, pp. 465-477).—Glycerin has a distinct, although feeble germicidal action. The germicidal action varies greatly with the temperature, being much feebler at a temperature of 15° C. than at from 30 to 35°. The germicidal action varies

with the diluent employed; in glycerin diluted with physiologic salt solution the micro-organisms died much sooner than in glycerin diluted with bouillon or with horse serum. In dilutions up to 50 per cent, glycerin did not destroy the bacillus of anthrax in 15 days. This may be due to the presence of spores. Glycerin seems to be a selective poison for the bacillus of plague, the spirillum of cholera, and the bacillus of diphtheria. In 50 per cent of glycerin in physiologic salt solution all the nonspore-forming organisms died in less than 4 days."

Changes of bacteria on the animal body (*Centbl. Bakt. [etc.], 1. Abt., Orig.*, 74 (1914), No. 3-4, pp. 285-294; 75 (1914), No. 2, pp. 159-173; 75 (1915), No. 5-6, pp. 394-398; 76 (1915), Nos. 1, pp. 38-46; 5, pp. 330-342).—The present papers, in continuation of a series on the subject, include an experiment on the formation of the capsule of the anthrax bacillus, by K. Rotky (pp. 285-294); the correlation between capsule formation, spore formation, and infectivity of the anthrax bacillus, by O. Ball (pp. 159-173); experiments on the power of resistance of capsulated and capsule-free anthrax bacilli, by J. Matsui (pp. 394-398); investigations of capsule-free anthrax, by O. Ball (pp. 38-46); and tests of the attenuation of the anthrax bacillus at 42°, by O. Ball (pp. 330-342).

Complement fixation in varicella, J. A. KOLMER (*Jour. Immunol.*, 1 (1916), No. 1, pp. 51-58).—While the experiments reported have shown that "an antibody in the nature of an amboceptor is present in the sera of persons suffering with varicella which will absorb complement in the presence of an antigen prepared of the cutaneous lesions of this disease, yet the percentage of positive reactions and particularly the degree of complement absorption is small. While immunity principles are in all probability present in the body fluids of persons for years after an attack of varicella these could not be detected by the complement-fixation tests in this study. All positive reactions were observed during or soon after an attack of the disease and at the time of probable highest concentration of antibodies. A more delicate technique would probably yield a higher percentage of positive reactions as is usual in all complement-fixation tests with bacterial antigens, but in this study this was avoided in order to guard against the possibility of nonspecific absorption of complement."

Complement fixation in vaccinia and variola, J. A. KOLMER (*Jour. Immunol.*, 1 (1916), No. 1, pp. 59-81).—Experiments reported show that about 60 per cent of the sera examined from patients suffering with mild smallpox yielded positive complement-fixation reactions with salt-solution antigens of variolous and cowpox viruses. Although the reactions in general were relatively weak those with the variolous antigens were somewhat stronger than those with the cowpox antigens. Alcohol extracts of variolous and cowpox viruses possessed little or no antigenic sensitiveness.

"These complement-fixation reactions have demonstrated the close biological relationship between the antibodies of vaccinia and variola; it is probable that complement-fixation reactions with salt-solution antigens of the contents of smallpox lesions or fresh cowpox virus will prove of some value in the diagnosis of smallpox."

The fate of various antibodies in the precipitin reaction, F. P. GAY and RUTH L. STONE (*Jour. Immunol.*, 1 (1916), No. 1, pp. 83-104).—The authors were unsuccessful in an attempt to separate out antibodies in a condition relatively free from other proteins. Their experiments have shown that most bacteriolysins and hemolysins, when associated either with the precipitinogen serum or with the precipitin serum, are not carried down in the precipitate. Similar negative results were obtained with artificial bacterial agglutinins and hemagglutinins. When the precipitate was produced by adding serum to

its antiserum the fixation complex was generally shown to be present in the precipitate. The fixation complex may, however, be present in the supernatant fluid, and was in most instances so found when a bacterial extract was added to an immune serum.

"In certain combinations it seems definitely shown that the fixation complex is present in that fraction (supernatant or precipitate) in which the protective bodies are absent. Thus in the case of pneumococcus precipitate produced by adding the extract of pneumococcus to antiserum from the horse, the protective bodies are present in the precipitate and the fixation complex is present in the supernatant fluid. The exact reverse is true in a combination of rabbit antihorse serum and horse antipneumococcus serum."

A bibliography of 28 references is appended.

Kidney lesions in chronic anaphylaxis, T. H. BOUGHTON (*Jour. Immunol.*, 1 (1916), No. 1, pp. 105-118, figs. 5).—Material examined from 23 guinea pigs demonstrated that "repeated anaphylactic shock induced . . . by injections of egg white or beef serum is able to produce lesions of the kidney that are not produced by acute anaphylaxis, nor by the repeated injection of these proteins in refractory animals. These lesions consist principally of necrosis of tubular epithelium, proliferation of glomerular capillary endothelium, and swelling and degeneration of the intima and media of small vessels. Small diffusely scattered areas of round-celled infiltration were observed in nearly all cases, somewhat similar to the areas observed in the controls, but usually larger, and invariably much more numerous than the spontaneous lesions. In this series the lesions noted are to be considered as subacute rather than chronic."

Biological researches on the eosinophils, M. WEINBERG and P. SÉGUIN (*Ann. Inst. Pasteur*, 28 (1914), No. 5, pp. 470-508, pls. 2).—From the investigation the authors have shown that the eosinophils, as well as the other white cells, possess chemotactic properties for certain toxic substances, as well as the original parasite, to an even greater extent than the other leucocytes. When the "eosinotactic" substances are absorbed in the infected tissue they cause a stimulation to the production of a large number of eosinophils and thus produce a local eosinophilia. This local action does not depend entirely on the toxic substance or parasites, but more especially on the number of eosinophils in the blood of the experimental animal. When they are present in great numbers the eosinotactic substances apparently cause an efflux of polymorphonuclear neutrophils. This result has also been obtained by injecting helminth products in the conjunctival tissue of the horse or in the muscle of the guinea pig. Intraperitoneal injection of such toxins into guinea pigs does not produce an efflux of eosinophils from the blood in the peritoneal exudate, since the eosinophils are arrested in the neighboring tissues of the peritoneum and thus constitute a local eosinophilia.

The intense local eosinophilia observed in the phenomenon of Arthus, attributed by some investigators to the chemotactic action of the eosinophils, has not been definitely determined. Injection into the peritoneal cavity does not produce a local eosinophilia in the lungs of the animal which survives the anaphylactic shock. The pulmonary eosinophilia, which is considered as a characteristic lesion of nonfatal anaphylaxis by some, preexists to a large extent as an eosinophilia in the blood. Such a condition manifests itself about 15 minutes after the injection of a sensitized guinea pig, and is considered a natural consequence of anaphylaxis. The direct action of the antigen on the hematopoietic center seems thus to be explained.

Biological researches on the eosinophils, II, M. WEINBERG and P. SÉGUIN (*Ann. Inst. Pasteur*, 29 (1915), No. 7, pp. 323-346, pls. 2; abs. in *Jour. Roy.*

Micr. Soc., No. 5 (1915), p. 508).—Continuing the investigation noted above, the authors have shown that the eosinophils possess phagocytic properties and are not only capable of ingesting inert material and bacteria but also protozoa and erythrocytes. The results obtained with *Bacillus subtilis*, *B. coli*, certain protozoa, and the red cells indicate that they are not only ingested but also completely digested. The eosinophilic phagocytosis takes place both *in vitro* and *in vivo* (peritoneal cavity, subcutaneous tissue, and circulating blood of the guinea pig).

When the eosinophils are very abundant in the blood, or when they accumulate at the point of inoculation, they play a very important part in the immediate protection of the organism against infection. When placed in contact with the fluid from a hydatid cyst for 1 hour at 37° C. they lose their phagocytic properties while the neutrophils and mononuclears are still strongly phagocytic. If a sufficient number are brought in contact with such a fluid it finally loses its antigenic properties, as is easily demonstrated by the complement-fixation reaction with a fresh echinococcus serum and a normal hydatid fluid as controls. Those of immunized animals were found to absorb the hydatid antigen more readily than those of normal animals. While possessing these properties they still play only a supplementary rôle in the actual process of phagocytosis.

It is concluded that the eosinophil leucocytes, together with the polynuclear neutrophils, are an important factor in immunity. Although the principal function of the neutrophils is to protect the organism against the invading micro-organisms, the eosinophils are especially adapted for neutralizing certain toxic products. The elaboration of the specific antibodies is probably the result of the absorption of toxic products.

Toxins of intestinal parasites, D. E. PAULIAN (*Presse Méd. [Paris]*, No. 49 (1915), p. 403; *abs. in Jour. Amer. Med. Assoc.*, 65 (1915), No. 22, p. 1954).—The author's investigations have led to the conclusion that intestinal parasites act on the organism through the production of toxins which result in congestion and degeneration of tissues, loss of resisting powers of the red corpuscles, intense anemia, and eosinophilia. The nervous disturbances and even the eosinophilia may be regarded as phenomena of anaphylaxis.

The morphology of the adults of the filaria found in the Philippine Islands, E. L. WALKER (*Philippine Jour. Sci., Sect. B*, 9 (1914), No. 6, pp. 483-491, pl. 1).—The author finds that the Philippine filaria is apparently identical with *Filaria bancrofti*.

Investigations of the development of the free living generations of lung-worms, COUNTESS VON LINDEM and L. ZENNECK (*Centbl. Bakter. [etc.]*, 1. Abt., Orig., 76 (1915), No. 2-3, pp. 147-178, pls. 4).—Studies of several species of *Strongylus* are reported upon.

African coast fever, L. E. W. BEVAN (*Rhodesia Agr. Jour.*, 12 (1915), No. 4, pp. 408-423, pls. 7, figs. 5).—A summarized account of the disease, with directions for dipping.

Anthrax, R. DE CASTRO Y RAMIREZ (*Estac. Expt. Agron. Cuba Bol.* 25 (1915), pp. 22, pls. 4, fig. 1).—A general account of this disease and its treatment.

Vaccination experiments against anthrax, A. EICHORN (*Jour. Amer. Vet. Med. Assoc.*, 48 (1916), No. 6, pp. 669-687).—Substantially noted from another source (E. S. R., 34, p. 579).

Investigations of foot-and-mouth disease, E. KALLETT (*Arb. K. Gesndtsam.*, 47 (1914), No. 4, pp. 591-613, pls. 4; 48 (1915), No. 3, pp. 351-380, pls. 2).—Several papers are presented which deal with the subject as follows: (1) Importance of the von Betege Bodies Found in Lymph of Affected Animals (pp.

591-602); (2) Contribution to the Histogenesis and Histology of the Vesicles, Particularly as Relates to the Question of the Occurrence of Inclusion Bodies in the Affected Parts (pp. 603-613); and (3) The Morphology and Biology of the Cytophytes Coccoi Reported by Siegel to be the Cause of Foot-and-Mouth Disease (pp. 351-380).

Concerning the filterability of trypanosomes, S. B. WOLBACH, W. H. CHAPMAN, and H. W. STEVENS (*Jour. Med. Research*, 33 (1915), No. 1, pp. 107-117).—The authors conclude that trypanosomes from cultures and from animal tissues are not filterable through bacteria-proof filters.

The effect of daylight and drying on the human and bovine types of tubercle bacilli, L. FINDLAY and W. B. M. MARTIN (*Vet. Rec.*, 28 (1915), No. 1430, pp. 253, 254).—From experimental evidence the authors have demonstrated that there is little appreciable loss of virulence of either type of the tubercle bacillus after seven days desiccation. Diffused daylight causes a definite lowering of the virulence in both types, the human type being avirulent within seven days. Under the combined influence of desiccation and diffused daylight there is a marked fall in virulence. This fall is more pronounced in the bovine than in the human type.

In general it is concluded that the bovine type is distinctly more susceptible to the effect of ordinary atmospheric influences than is the human type. Such difference may explain in part why aerial infection with the bovine type is so infrequent in the human organism.

The intracutaneous tuberculinization of chickens, J. F. H. L. VAN LEEUWEN (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 76 (1915), No. 4, pp. 275-288).—From the investigation it is concluded that the intracutaneous tuberculinization yields fairly reliable results in the diagnosis of tuberculosis in chickens. The turgescence which occurs after the injection is of no significance in the diagnosis, but in judging a reaction the general state of nutrition of the animal must be taken into consideration. If it is desired to reinject, the usual intermission of several weeks is not necessary as the injections may be given during or shortly after the reaction. Local anaphylaxis following a previous injection does not occur in healthy chickens. In making the test it is necessary to use avian tuberculin.

A bibliography of 21 references is appended.

The success and failure of the tuberculin test in certified dairies, C. L. ROADHOUSE (*Jour. Amer. Vet. Med. Assoc.*, 48 (1916), No. 4, pp. 420-429).—Methods of scientific supervision in certified dairies which have given satisfactory results are outlined, and experimental results obtained from the subcutaneous and intradermal tuberculin tests are submitted. It is indicated that "the intradermal test is somewhat more searching in its diagnosis of incipient cases of tuberculosis in animals than the subcutaneous."

The diagnosis of infectious abortion in cattle by means of the Abderhalden dialysis procedure, K. KATZ (*Wiener Tierärztl. Monatsschr.*, 2 (1915), No. 4, pp. 161-172).—The results of the author's investigation have demonstrated that the serum of animals naturally or artificially infected with *Bacillus abortus* is capable of cleaving the protein of abortion bacilli. Normal serum does not possess this property. The dialysis procedure is, therefore, specific in infectious abortion in cattle and is valuable as a diagnostic method, the results being almost perfect accord with those obtained by the agglutination reaction. The number of failures is no greater than the usual experimental error due to faulty technique.

The special preparation of the antigen, or substrate, is described in detail, and the experimental data are presented in tabular form. A bibliography of 34 references is appended.

A further contribution on the biology of *Hypoderma lineatum* and *H. bovis*, S. HADWIN (*Parasitology*, 7 (1915), No. 4, pp. 331-338, pls. 2).—Substantially noted from another source (E. S. R., 33, p. 775).

Trichinosis.—Report of a case with the trichina larvæ in the spinal fluid, L. BLOCH (*Jour. Amer. Med. Assoc.*, 65 (1915), No. 25, pp. 2140, 2141, fig. 1).—This is a report of a case in which trichina larvæ were found in the cerebro-spinal fluid. "Meningeal irritation undoubtedly exists, as is shown by the positive Nonne and Noguchi tests. Severe infections show low eosinophil count during the acute stage, which increases with convalescence."

Salvarsan treatment of infectious catarrh of the upper respiratory tract of the horse, BARTIEL (*Ztschr. Veterinärk.*, 27 (1915), No. 3, pp. 65-68; *abs. in Vet. Rec.*, 28 (1915), No. 1423, pp. 167, 168).—The author reports that successful results have followed the administration of 4.5 gm. of neosalvarsan dissolved in 100 cc. of distilled water and injected intravenously, the injections varying from one to five days after the first appearance of symptoms of the disease. Fifteen horses were thus treated and four slightly infected cases left for controls. The symptoms of the disease were very characteristic, so that it was possible to exclude strangles and equine infectious pneumonia from the diagnosis. The fever diminished in from 12 to 90 hours after injection and an improvement of the general condition appeared. The controls continued to have irregularities of temperature, pulse, and respiration for some time.

I. Some further studies of chick mortality, B. F. KAUFF (*North Carolina Sta. Bul.* 235 (1916), pp. 3-11, 15).—These pages discuss the causes of chick mortality, and report experiments undertaken to determine the effect of feeding various kinds of sour milk and buttermilk in reducing this mortality. All of the lots were raised on ground infected by *Bacterium pullorum*.

In addition to a grain mixture four lots of chicks received the following feeds: Lot 1, sour milk (clabber); lot 2, artificial buttermilk made by *Bacillus bulgaricus*; lot 3, buttermilk made from *B. acidi lactici*; and lot 4, a control lot, no milk. Diarrhea attacked the flocks, resulting at the end of the 8-week period in a 16 per cent loss in lot 1, 10 per cent in lot 2, and 12 per cent in lot 3. In lot 4 diarrhea claimed a toll of 24 per cent during the first four weeks and left the remainder of the flock in such a wrecked condition, constitutionally, that by the end of eight weeks 36 per cent had died.

In individual records of 8 White Leghorns 4 were infected with diarrhea and, although they survived at the end of eight weeks, they averaged only 0.56 lb. in weight, while those that were not attacked averaged 0.74 lb. Eleven birds were attacked by diarrhea and at the end of eight weeks averaged only 0.28 lb. each in weight, while 8 birds which were not affected by diarrhea averaged 0.47 lb. each in weight.

It is concluded that normal, artificial buttermilk, and sour milk are beneficial in baby chick feeding, serving to ward off severe attacks of diarrhea and resulting in greater gains in the chicks. The feeding of sour milk is recommended to begin as soon as the chick is taken from the incubator or nest.

The diseases of poultry, J. EHRHARDT (*Die Krankheiten des Haushuhes*. Aarau: Emil Wirs, 1914, 3. ed., pp. VIII+69).—A third edition of this small handbook.

RURAL ENGINEERING.

Flow through weir notches with thin edges and full contractions, V. M. COSE (U. S. Dept. Agr., *Jour. Agr. Research*, 5 (1916), No. 23, pp. 1051-1113, pl. 1, figs. 24).—Laboratory equipment and methods used are described and experiments conducted under a cooperative agreement between the Office of Experiment Stations of this Department and the Colorado Experiment Station on

notches with thin edges and full contractions to determine the accuracy of the Francis and Cipolletti formulas for notches of the sizes ordinarily used in irrigation practice are reported.

It was found that "the discharges through rectangular and Cipolletti notches when plotted logarithmically do not give straight lines and therefore can not be represented correctly by a formula of the type $Q=CH^n$. It was found, however, in the case of the rectangular notches experimented with and the heads of water run, that a straight-line formula could be deduced that within the range of the experiments gave values quite close to the experimental data.

"The formula

$$Q=3.247LH^{1.48}-\left(\frac{0.566L^{1.8}}{1+2L^{1.8}}\right)H^{1.9}$$

gives discharge values for 1-, 1.5-, 2-, 3-, and 4-ft. rectangular notches that agree within a maximum of approximately 1.2 per cent and within an average of 0.28 per cent with the curves plotted from the experimental data. The discharges throughout the 0.5-ft. rectangular notch do not follow the same law as those for the longer notches. The formula

$$Q=1.593H^{1.022}\left(1+\frac{1}{800H^{2.8}}\right)$$

gives values consistent with the curve plotted from the experimental data.

"The Francis formula gives values within approximately 2 per cent of the actual discharges, so long as the head does not exceed one-third the length of the notch. Within the limits of the experiments the formula

$$Q=3.08L^{1.022}H^{(1.46+0.003L)}$$

gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. rectangular notches that agree within a maximum of 0.7 per cent, and an average of 0.26 per cent, with the values given in the curves plotted from the experimental data. The formula $Q=1.566H^{1.504}$ gives values for the 0.5-ft. rectangular notch that agree within 1 per cent with the curves plotted from the experimental data. The curve-line formula for rectangular notches takes account of the law of variation of the discharge curves better than does the straight-line formula and, consequently, it appears that it will give closer values for higher heads and longer notches than those experimented with.

"The formula

$$Q=3.247LH^{1.48}-\left(\frac{0.566L^{1.8}}{1+2L^{1.8}}\right)H^{1.9}+0.609H^{2.5}$$

gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. Cipolletti notches that agree within 0.5 per cent with the curves plotted from the experimental data, except in the case of the lower heads on the 1-ft. notch, where the maximum divergence is approximately 1.5 per cent. The discharges through the 0.5-ft. Cipolletti notch do not follow the same law as those for longer notches. The formula

$$Q=1.593H^{1.526}\left(1+\frac{1}{800H^{2.3}}\right)+0.587H^{2.53}$$

represents the discharges through such a notch.

"The Cipolletti formula gives discharge values within 1.5 per cent of the actual discharges so long as the head does not exceed one-third the length of the crest of the notch. The formula

$$Q=3.08L^{1.022}H^{(1.46+0.003L)}+0.6H^{2.6},$$

which is based on the straight-line formula for rectangular notches, gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. Cipolletti notches that agree within a maximum of 1 per cent with the curves plotted from the experimental data, the divergences at all but a few points being 0.5 per cent or less. The formula for the 0.5-foot notch is $Q=1.566H^{1.94}+0.56H^{2.35}$. The Cipolletti type of notch does not give discharges as nearly proportional to the length of crest as does the rectangular type, consequently, . . . the rectangular-notch weir is to be preferred.

"The general formula for discharges through triangular notches of from 28° 4' to 90° , and probably up to 109° , is

$$Q=(0.025+2.462S)H\left(\frac{2.5-0.0195}{80.75}\right)$$

where H is the head in feet and S the slope of the sides. Triangular notches having side slopes greater than about 1:4 (109°) are impractical, as the nappe adheres. The 90° triangular notch is the most practical triangular notch and should be used in preference to either rectangular or Cipolletti notches for discharges up to approximately 3 cu. ft. per second. The approximate formula $Q=2.49H^{2.48}$ will give discharge values for 90° notches which agree very closely with the value obtained with the general formula for triangular notches.

"The crest and sides of a weir notch need not be knife-edged. They are sufficiently sharp if the upstream corner of the edges is a distinct angle of 90° or less and the thickness of the edges is not so great that the water will adhere to them. The head should be measured upstream from the weir a distance of at least $4H$, or sidewise from the end of the crest in the plane of weir a distance of at least $2H$.

"The distances required for full contractions with rectangular and Cipolletti notches are approximately $2H$, but an additional cross-sectional area of the weir box is required to reduce the velocity of approach.

"With end contractions equal to $2H$ and a bottom contraction equal to $3H$, or end contractions equal to $3H$ and a bottom contraction equal to $2H$, the mean velocities of approach are about $\frac{1}{3}$ ft. per second, and the discharges with medium to high heads do not agree more closely than approximately 1 per cent with the discharges computed by the formulas. The average ratio of the cross-sectional area of the weir box to the cross-sectional area of the notch required to give discharges within 1 per cent of the values obtained with the formula is greater than 7 and is probably near 15.

"In order to make the results comparable with those for rectangular notches, the end contractions for trapezoidal notches should be measured from about the middle point of the side of the notch, rather than from the end of the crest. A notch which would give discharges proportional to the lengths of the notches would probably have curved sides, the slope decreasing with the head.

"For all practical purposes, discharges through rectangular and Cipolletti notches are not affected until the notch is submerged to a depth equal to one-tenth the head upstream from the weir. Submergence equal to one-eighth the head upstream from the notch decreases the discharge approximately 2 per cent, that equal to one-fourth approximately 6 per cent, and that equal to one-third approximately 9 per cent."

Notes on the duty of water, J. W. BEARDSLEY (*Cornell Civ. Engin.*, 24 (1916), No. 4, pp. 153-160, figs. 2).—It is the purpose of this paper "to indicate some of the questions arising in a determination of the area to be developed under a given water supply, with special reference to conditions existing along the relatively dry coastal plains on the south side of Porto Rico. . . .

"The duty of water for the Porto Rico Irrigation Service, as defined by law, is '4 acre-feet per acre per annum, the said standard to be applied on the basis of fair average years.' Irrigation is carried on continuously throughout the year. The crop is practically entirely sugar cane and it is planted during both spring and fall months."

From experiments from various sources and general conditions in Porto Rico, a curve is given showing "that the value of water in percentage of yield rapidly decreases as a maximum crop is approached, and unless water is very cheap its use beyond that point will not be financially profitable. Up to about 85 per cent its use is of maximum value, thence up to 100 per cent of minimum value to the crop. . . . As the maximum tonnage is passed, the percentage of sucrose in the cane decreases more rapidly than the tonnage of yield on account of the harmful effect of surplus water and oversaturation of the soil. Also between 30 and 80 per cent yields an increase per annum of 1 in. of beneficial water gives 1.8 per cent increase in yield."

Other climatic and hydrographic data are reported "to illustrate the danger of using [such] data covering short periods of time as fair bases for technical problems and the construction of expensive structures."

The use of mud-laden water in drilling wells, I. N. KNAPP (*Trans. Amer. Inst. Mining Engin.*, 51 (1916), pp. 571-586, figs. 2).—The object of this paper "is to describe the mixing, testing, and use of mud-laden water for rotary drilling in such a way as to make them helpful to the driller, the operator, or the engineer in solving his own special drilling problems. The structures, apparatus, and tools used are indicated in a general way. . . .

"The information is the result of actual experience in drilling in Coastal Plain formations. The materials encountered in the wells drilled were unconsolidated sands, gravels, and clays, in which thin layers of sandstones, shell conglomerates, and shales began to appear at about 1,200 ft. in depth."

Irrigation in Netherlands East India (*Netherlands East Indian San Francisco Com., Dept. Agr., Indus., and Com., Essay No. 12* (1914), pp. 72, pls. 5, figs. 10).—This pamphlet describes the climate, rainfall, and surface water supplies of Java and the distribution and extent of the rice fields of Java and Madoera, discusses the cultivation of crops needing irrigation, and sketches the history and development of irrigation in the Dutch East Indies. Brief descriptions of some of the chief irrigation works are also included. Other topics dealt with are drainage and flood protection; harmful influence of active volcanoes on irrigation works; reservoirs for irrigation purposes; development of the water management, cost of management and maintenance; expenditure and staff for irrigation purposes; results obtained from irrigation works; and irrigation in the possessions beyond Java and Madoera.

Surface water supply of north Pacific drainage basins, 1912, N. C. GROVES, F. F. HENSELAW, G. C. BALDWIN, and W. A. LAMB (*U. S. Geol. Survey, Water-Supply Paper 332* (1916), pp. XI+748, pls. 2).—This report combines the material covered by Parts A-C, previously noted (E. S. R., 32, p. 587; 33, pp. 484, 880). .

Water powers of the Cascade Range.—III, Yakima River basin, G. L. PARKER and F. B. STOREY (*U. S. Geol. Survey, Water-Supply Paper 369* (1916), pp. 169, pls. 20, figs. 12).—This report, prepared in cooperation with the Washington Geological Survey, is based on data consisting of stream-flow records, river plans and profiles, reservoir surveys, and field reconnaissances of streams in the Yakima River basin, an area of about 5,970 square miles slightly southeast of the geographic center of Washington, continuing previous work (E. S. R., 24, p. 313; 29, p. 84).

The regulation of rivers, J. L. VAN ORNUM (*New York and London: McGraw-Hill Book Co., 1914, pp. X+393, pls. 6, figs. 96; rev. in Engin. News, 74 (1915), No. 25, p. 1170.*)—This book considers the principles underlying the regulation of rivers. It contains chapters on commercial considerations, general phenomena, investigations, surveys, etc., methods of river improvement, the principles of regulation, works of channel contraction, the protection of erodible banks, dredging, levees, and the control of the current.

Proceedings of the eleventh annual meeting of the Iowa State Drainage Association (*Proc. Iowa State Drainage Assoc., 11 (1915), pp. 111, figs. 5.*)—The following special articles are included in these proceedings:

Platting and Recording Tile Drainage Systems, by C. B. Platt; Soil Erosion, by B. Brooks; Planning and Building Farm Drainage Systems, by F. O. Nelson; Draining and Farm Units, by J. M. Wells; Drainage by Wells, by J. T. Stewart; Soil Moisture—Under Drainage and Crop Production, by W. J. Schlick; Drainage Improvements and Their Relation to Sanitary Conditions, by L. Higgins; Some Sanitary Benefits Resulting from Drainage, by W. Grant; Problems of Drainage Contractor, by H. B. Whitney; Legal Problems in Operating Under the Iowa Drainage Law, by T. P. Harrington; The National Aspect of Drainage, by E. T. Perkins; Levying Drainage Assessments, by G. R. Campbell; and Methods of Paying Drainage Engineers for Their Services, by A. G. Baker.

Proceedings of seventh annual drainage convention of the North Carolina Drainage Association, 1914, compiled by J. H. PRATT and Miss H. M. BERRY (*N. C. Geol. and Econ. Survey, Econ. Paper 41 (1915), pp. 70, figs. 3.*)—These proceedings contain the following special articles:

The Upbuilding of Eastern Carolina Through Drainage and the Resulting Benefits to the Railroads, by B. E. Rice; Tile Drainage, by W. E. Sherwin; The Importance of Principles of Farm Drainage, by H. M. Lynde; The Drainage and Development of North Carolina's Muck Lands, by C. W. Mengel; North Carolina Drainage Law and Some Needed Amendments, by J. H. Small; and Some New Factors in Drainage Work in North Carolina, by L. Brett.

The hydraulic ram, R. B. ROBB (*Cornell Countryman, 13 (1916), No. 4, pp. 275-281, figs. 7.*)—The construction and operation of single- and double-acting hydraulic rams are illustrated and described, and the results of performance tests of a typical ram operating under fixed heads, but with varying lengths of stroke of the dash valve, are graphically reported. The mathematical theory of the operation of the hydraulic ram is also briefly presented.

Electrically driven dragline scrapers dig 45-mile irrigation canal (*Engin. Rec., 73 (1916), No. 5, pp. 147, 148, figs. 3.*)—Data on unit costs of excavating 1,500,000 cu. yds. of material in two seasons with two machines on the Sun River project of the U. S. Reclamation Service are given.

A comparison between bleach and liquid chlorin disinfection, C. R. AVERY (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 142-149.*)—Experiments are reported comparing bleaching powder and liquid chlorin for the disinfection of water.

The results are taken to indicate that "taking the results as a whole the advantage of what difference there is seems to lie with the bleach. This difference is small, however, and the conclusion is that if a normal water supply be treated with the same amount of available chlorin, whether from bleaching powder or liquid chlorin, and provided proper mixing takes place, the disinfection in either case will be the same."

Does alum inhibit the action of chlorin as a disinfectant? C. R. AVERY and O. G. LYNE (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 150-155.*)—Experiments on the effect of alum on the action of chlorin as a disinfectant for water are reported.

The results are taken to indicate that while the addition of alum immediately causes a considerable reduction in the available chlorin content the disinfecting qualities of the bleach are not apparently affected under a period of 12 hours. The addition of alum to bleach solutions did not have the effect of lowering the bacteriological efficiency appreciably along with the reduction of available chlorin during the first 12 hours; but after this period a perceptible change in efficiency was evidenced.

"The addition of varying amounts of alum does not cause results corresponding to the amounts added. . . . The amount of chlorin in parts per million appears to be reduced in direct proportion to the amount of alum added up to a certain limit, after which the further addition of alum has little effect on the available chlorin."

American sewerage practice, L. METCALF and H. P. EDDY (*New York and London: McGraw-Hill Book Co., 1914*, vol. 1, pp. X+747, pls. 25, figs. 223; 1915, vols. 2, pp. X+564, pls. 18, figs. 163; 3, pp. XIII+851, pl. 1, figs. 229; vol. 3 rev. in *Engin. News*, 74 (1915), No. 25, pp. 1168, 1169).—This treatise deals, in three volumes, with the design and construction of sewers and with sewage disposal.

The chapters of volume 1, Design of Sewers, are as follows: The lessons taught by early sewerage works; the general arrangement of sewerage systems; flow of water in pipes and channels; velocities and grades; measurement of flowing water; quantity of sewage; precipitation; formulas for estimating storm-water flow; the rational method of estimating storm-water run-off in sewer design; gaging storm-water flow in sewers; sewer pipe; the design of masonry sewers; examples of sewer sections and the loads on sewers; the analysis of masonry arches; street inlets, catch basins, and manholes; junctions, siphons, bridges, and flushing devices; regulators, overflows, outlets, tide gates, and ventilation; and sewage pumping stations.

Volume 2 deals with the construction of sewers, as follows: Preliminary investigations; engineering work and inspection during construction; excavation; machinery for trench excavation; methods of rock excavation; explosives and blasting; quantity and cost of excavation; rate of progress in building sewers; the sheeting and bracing of trenches and tunnels; sizes of sheeting, rangers, and braces; purchasing, handling, and laying sewer pipe; jointing sewer pipe; construction of brick and block sewers; construction of concrete sewers; profiles, templates, forms, and centers; contracts, specifications, and drawings; technical specifications; operation and maintenance of sewerage systems; and explosions in sewers.

The chapters of volume 3, Disposal of Sewage, are as follows: Introduction—progressive steps in sewage treatment; meaning of chemical analyses; bacteria and their relation to the problem of sewage disposal; plankton; composition of sewage; theories of sewage disposal and treatment; sewage disposal by dilution; grit chambers; racks, cages, and screens; sedimentation, straining, and aeration; tanks for sludge digestion; chemical precipitation; sludge; contact beds; trickling filters; intermittent sand filtration; irrigation and the agricultural utilization of sewage and sludge; automatic apparatus for dosing; disinfection of sewage and sewage effluents; and disposal of residential and institutional sewage.

With reference to sewage irrigation and the use of sewage and sludge for fertilization, experience in this country and in Europe is reviewed and it is stated that "the popular opinion of the value of sewage in agriculture is much exaggerated. The fertilizing value of sewage is far less than is commonly supposed, on account of the great dilution of the constituents serviceable to plant life, nitrogen, phosphates, and potash, and, further, because only a part of these substances is present in the sewage in a form suitable for fertilizing pur-

poses. . . . Nitrification is checked if sewage is turned over land in too great quantities or if the air is cold, and if the sewage is applied freely there is a tendency to wash out of the soil what nitrates have formed. In considering the fertilizing value of sewage it is also necessary to consider its ingredients which are detrimental to agriculture. The fat and soap may work harm by clogging the pores of the soil and thus counterbalance the small improvement due to the nitrogen, phosphoric acid, and potash. . . . In sewage disposal . . . the crops should be regarded as merely a by-product. All evidence furnished by many years' experience in many countries under many conditions does not reveal, however, any decisive proof that it is possible to obtain much fertilizing value from city sewage as it must be used to make irrigation practicable, but indicates that where sewage irrigation has been successful agriculturally, irrigation with water would have produced about the same results. English experience indicates that whatever profit is to be made in the future from the fertilizing ingredients of sewage will probably result from the production of artificial manures from sludge."

In a chapter on the disposal of residential and farm sewage, it is stated that "where the desired degree of purification of the sewage is high and the treatment involves methods of filtration which should proceed at fairly regular rates, it is evident that the storage of sewage so as to permit fairly uniform delivery to the filters and some uniformity in the composition of the applied liquid by mixing the laundry wastes, kitchen wastes, and domestic sewage together becomes particularly important. In the second place, the small size of the plants makes it desirable to have them as nearly fool-proof and automatic as possible. Even if the owner's means render economy in management unnecessary, the importance of automatic operation is great because experience shows that regular attendance is rarely given to these little plants."

Septic tanks and absorption systems, T. D. BECKWITH and T. A. H. TEETER (*Oreg. Agr. Col. Ext. Div., Ser. 2, No. 8, pp. 18, figs. 9*).—This publication deals with the design and construction of small sewage disposal systems, consisting essentially of a septic tank and tile absorption area. The designs are based on the views of both the engineer and bacteriologist.

It is pointed out that "the septic tank, if made water-tight, can be located anywhere outside the cellar wall without danger of disease or bad odors. . . . The sewer from the house should consist of a 4- to 6-in. vitrified sewer pipe with a trap near the house end to form a water seal in order to guard against the escape of sewer gas into the house." The necessity of compartments in a septic tank is emphasized, and it is stated that "the scum which forms on the surface of the sewage in the first chamber is essential to the proper action of the tank."

Statements regarding other points of controversy among authorities are made as follows: "The tank becomes nothing more nor less than a large culture chamber for the growth of the proper kinds of bacteria, and upon them solely depends the work of purification of sewage entering the tank. . . . The types of bacteria in a septic tank are two, (1) those which thrive without the presence of free oxygen or air and which demand that the portion of the tank in which they grow must be as nearly air-tight as practicable, and (2) those which require oxygen to thrive and which do their work best in the presence of as much air as possible. The second compartment, where the bacterial action is completed, should be so constructed that air may have free entrance and circulation. . . . A septic tank which purifies over 70 per cent is very exceptional, and generally only from 60 to 65 per cent purification may be expected."

Sewage treatment in small communities where a sewerage system is not available, P. HANSEN (*Ill. Health News, n. ser., I* (1915), No. 11, pp. 179-184, figs. 5).—This article describes and diagrammatically illustrates a type of common settling tank, a small Emscher double-deck or two-chamber tank, and a tile absorption system for the disposal of residential or farm sewage.

"No part of a subsurface drainage system should be within 200 ft. of any well, assuming an ordinary gravelly or sandy soil. If limestone is near the surface, the danger to wells is infinitely increased. However, the subsurface irrigation system is of far less danger to wells than is the ordinary leaching cesspool. This device is an abomination that should not be permitted in any built-up community, for it is almost impracticable to keep them at a safe distance from shallow wells."

Economy of deep percolating filters, H. W. CLARK (*Surveyor, 48* (1915), No. 1245, pp. 540, 541, figs. 2).—Recent experiments made at the Lawrence, Mass., experiment station on the efficiency of four trickling filters 4, 6, 8, and 10 ft. deep, respectively, are reported, each filter being operated at rates of 500,000, 800,000, 1,000,000, 1,500,000, and 2,500,000 gal. per acre per day. Salt was added to the sewage as an indicator of the filter activity.

With the 1,000,000-gal. flow rate "50 per cent of the sewage applied to the 4-ft. filter reaches the filter outlet mingled with 50 per cent of the held sewage 12 minutes after its application, while with the 10-ft. filter 125 minutes elapse before 50 per cent of the applied salt sewage reached the filter outlet mingled with 50 per cent of the held sewage." With the other rates of flow "the applied and held sewage were about equally intermingled and hence were about equal periods of time in passing through each filter."

These results are taken to indicate the great economy of deep trickling filters as compared with shallow trickling filters.

The oxidation of sewage without the aid of filters, II, E. ARDERN and W. T. LOCKETT (*Jour. Soc. Chem. Indus., 33* (1914), No. 23, pp. 1122-1124).—A continuation on a larger scale of the experiments previously reported (E. S. R., 32, p. 337), using the continuous flow and fill and draw methods, is reported.

"The effluents obtained throughout this series of experiments were extremely well clarified and in general were superior to those yielded by the best type of bacterial filters. The outstanding feature of these results is the fact that by employing diffused air the necessity for intermediate aeration and consequent manipulation of sludge was entirely removed and at the same time much better effluents were obtained than those yielded by plain pipe aeration when working with a similar aeration period.

The effluents obtained in the earlier laboratory experiments, when working with a six hours' plain pipe aeration period, were liable to absorb an undue proportion of dissolved oxygen. . . . In the series of outdoor experiments . . . the dissolved oxygen absorption of the effluents was remarkably low. This low dissolved oxygen absorption, being coincident with a very low free ammonia content, appears to support the theory previously advanced, that the stage to which nitrification has proceeded is not without influence on the amount of dissolved oxygen absorbed."

The oxidation of sewage without the aid of filters, III, E. ARDERN and W. T. LOCKETT (*Jour. Soc. Chem. Indus., 34* (1915), No. 18, pp. 937-943, figs. 2; *Surveyor, 48* (1915), No. 1241, pp. 450-454, figs. 2).—A third contribution to the subject gives the results obtained to date regarding "(1) the initial production of activated sludge; (2) the volume of air essential for the successful working of the purification process; and (3) the most advantageous proportion of activated sludge to employ; together with a description of certain experiments relating to the purification of a dilute domestic sewage."

The results are taken to indicate " (1) that, apart from the use of sludge from percolating filters, the initial production of activated sludge can be facilitated and obtained with considerably less air cost than originally was the case, (2) that under certain controlled conditions the volume of air required may be considerably less than previously estimated, and (3) that there is an economic advantage in employing an increased volume of activated sludge with special reference to the rate of nitrification." It is concluded "that the estimated costs of aeration indicate that the activated sludge method of sewage purification is eminently a practical process."

Experiments to determine the economic possibilities of sludge from Emscher or Travis tanks, A. V. DE LAPORTE (*Ann. Rpt. Prov. Bd. Health Ontario*, 33 (1914), pp. 139-141, fig. 1).—Experiments are reported, the results of which to date are taken to indicate that "(1) the sludge has practically no value as a fertilizer or a fuel, (2) extraction for the recovery of the grease or distillation with superheated steam would not pay, and (3) destructive distillation designed to recover the grease, gas, ammonia, etc., might cover expenses."

Tables facilitate accuracy in timber beam design, R. C. HARDMAN (*Engin. Rec.*, 73 (1916), No. 5, pp. 138, 139).—The errors in the usual practice of timber beam design based on nominal sizes are pointed out, it being stated that deficiencies in sizes of timbers vary from $\frac{1}{4}$ to $\frac{1}{2}$ in. Factors to be applied to tables of safe loads and a table of actual sizes, sectional areas, and section moduli for commercial lumber surfaced on one side and one edge are given.

Influence of temperature on the strength of concrete, A. B. McDANIEL (*Univ. Ill. Engin. Expt. Sta. Bul.* 81 (1915), pp. 24, figs. 15; *abs. in Engin. and Contract.*, 44 (1915), No. 21, pp. 405-408, figs. 7).—Experiments on the influence of temperature on the attainment of strength in concrete are reported. These included three groups of tests, namely, 45 6- by 6-in. cylinders, 51 6-in. cubes, and 60 8- by 16-in. cylinders. The concrete was composed of 1 part cement, 2 parts sand, and 4 parts broken stone, by weight, corresponding to 1 part cement, 2.2 parts sand, and 3.6 parts broken stone, by volume. The test specimens were stored in temperatures varying from 26.5 to 95.6° F. The temperature of storage was determined by daily readings of the maximum and minimum thermometers. The following conclusions are considered justifiable:

"Under uniform temperature conditions, there was an increase of strength with age within the limits of the tests. For any temperature the rate of increase decreases with the age of the specimen, and this rate of increase is less correspondingly at the lower temperature conditions. For the specimens tested, under normal hardening temperature conditions of from 60 to 70°, the compressive strength of the concrete subjected to a uniform temperature at the ages of 7, 14, and 21 days may be taken as approximately 50, 75, and 90 per cent of the strength at 28 days, respectively. For lower temperatures the percentage values are less, and for higher temperatures the percentages are higher. The relation between the percentage values at the ages of 7, 14, 21, and 28 days is nearly the same for temperature conditions from 30 to 70°. However, the values for the lower temperatures should be used with caution, concrete which is maintained at a temperature of from 60 to 70° will at the age of one week have practically double the strength of the same material which is kept at a temperature of from 32 to 40°."

Curves of the results are also presented for convenient use.

Use of water-gas tar and coal tar on concrete subjected to high velocities of water, C. H. PAUL (*Reclam. Rec. [U. S.]*, 7 (1916), No. 1, p. 46; *Engin. and Contract.*, 45 (1916), No. 3, p. 56).—The use of water-gas tar and coal tar on the concrete surfaces of the regulating outlets through the Arrowrock dam is

described. These outlets are 4 ft. 4 in. in diameter and are subjected to velocities of 60 ft. per second or higher. The purpose of such surfacing was "not so much that of waterproofing as to fill all the minute voids in the surface of the outlets, so as to prevent, if possible, the erosion caused by the formation of vacuum in small voids or pockets."

The results from one year's service tests are taken to indicate "that the use of this tar coating gave thoroughly satisfactory results."

The use of concrete for protecting wood-stave pipe, K. A. HERON (West. Engin., 7 (1916), No. 1, pp. 27-29, figs. 4).—This article describes the remodeling of two partially decayed wood-stave pipe lines in Colorado. Repairs were made by covering the pipe with concrete. Cost data are included.

Methods for the determination of the physical properties of road-building rock, F. H. JACKSON, JR. (U. S. Dept. Agr. Bul. 347 (1916), pp. 27, figs. 12).—This bulletin is a partial revision of Office of Public Roads Bulletin 44 (E. S. R., 27, p. 587). It is limited to a description of methods employed by the Office of Public Roads and Rural Engineering for testing rock for road building, and "is intended to serve as a more or less permanent laboratory manual for those who have occasion to make such tests." It deals with the physical properties of road-building rock and physical tests of road materials, including specific gravity, weight per cubic foot, water absorption, Deval abrasion test, hardness test, toughness test, cementing value test, and compression test. Two appendixes deal with the selection and shipment of samples and laboratory equipment.

Proceedings of the thirteenth annual meeting of the Ontario Good Roads Association, 1915 (Proc. Ontario Good Roads Assoc., 13 (1915), pp. 201, pls. 3).—These proceedings include the following special papers: Road Construction in New York State, by G. C. Diehl; Wearing Surfaces, by G. W. Tillson; Finance, by S. L. Squire; Road Laws, by B. Michaud; Bridges and Culverts, by L. E. Allen; State Roads of New Jersey, by R. A. Meeker; Road Foundations, by J. Duchastel; Machinery, by F. E. Ellis; Dust Prevention, by W. W. Crosby; Maintenance of Roads, by G. Henry; Road Organization, by G. H. Henry; Road Location, by C. R. Wheelock; Gravel and Stone Roads, by C. Talbot; The Evolution of the Asphalt Pavement in Toronto, by G. Powell; Good Roads and the Contractor, by H. T. Routly; Traffic and Its Relation to Road Construction, Maintenance, and Cost, by W. D. Sohier; Brick Roads and Streets, by E. A. James; Bituminous Construction, by J. Pearson; Concrete Roads and Streets, by H. S. Van Scyoc; and Creosoted Wood Block Pavements, by A. F. Macallum.

Annual report on highway improvement, Ontario, 1914 (Ann. Rpt. Highway Imp. Ontario, 1914, pp. 110, figs. 36).—This report deals with the following subjects related to highway improvement: Expenditure by counties, model and experimental roads, bituminous roads, operation and care of machinery, cost keeping and accounting, bridges and abutments, types of county roads, broken stone roads, gravel roads, drainage, the geology of road building materials, the testing of stone and gravel, culverts, explosives, and asphaltic deposits.

Report of the surveyor general for the year 1914, A. A. SPOWERS (An. Rpt. Dept. Pub. Lands Queensland, 1914, pp. 84-98, pls. 5).—The activities and expenditures of the Queensland surveyor general's office for 1914 are reported together with the reports of district surveyors. These include surveys of lands, roads, etc.

When the boiler needs attention (Power Farming, 25 (1916), No. 1, pp. 42-44, figs. 5).—Methods of repairing boilers of steam tractors are described and illustrated.

How to install the farm gasoline engine, G. H. MATHEWSON (*Gas Power*, 13 (1916), No. 8, pp. 10, 12, 14, figs. 5).—Brief hints are given regarding the installation of an engine, special reference being made to the construction of a proper foundation.

Antifreezing solutions for your engine, C. P. SHATTUCK (*Gas Power*, 13 (1916), No. 8, pp. 54, 56).—Ways and means of preventing frozen radiators and cracked cylinders are briefly described, and a table showing the combinations and freezing points of calcium chloride solutions, alcohol, glycerin, and glycerin and alcohol mixtures is given.

General notes on power farming, E. R. WIGGINS (*Power Farming*, 25 (1916), No. 1, pp. 18, 19).—Data on operating the cream separator, on gas engine operation and efficiency, and on grinding feed with an engine are briefly presented.

Directory and specifications of gasoline and oil farm tractors (*Farm Machinery*, No. 1265 (1916), pp. 40-43).—This is a second directory, said to be complete to date.

The latest idea in tractor harvesting, E. L. WATSON (*Gas Power*, 13 (1916), No. 8, pp. 5, 6, fig. 1).—A means devised and used for operating the binder levers from the engine seat consisted of disconnecting the bundle carrier trip rod and attaching it to a foot lever on the engine frame, transferring the binder shifting lever from the seat pipe and the lever for raising and lowering the reel to the stub tongue within easy reach of the operator.

The daily working capacities of motor plows and formulas for their determination, THALLMAYER (*Mitt. Deut. Landw. Gesell.*, 30 (1915), No. 52, pp. 791-794).—The results of different tractor plowing tests are reviewed, with special reference to the relation between brake and drawbar horsepower, depth of plowing, actual hours of work, etc.

The following formula for the determination of daily plowing capacity of tractor plows is proposed: $F=27 \frac{(\alpha Z)(\beta N)}{tW}$, in which F =area plowed in hectares, Z =gross hours of work, N =brake horsepower of tractor, t =depth of plowing in centimeters, W =soil resistance in kilograms per square decimeter, and α and β are coefficients, the former indicating the relation between gross and net working hours and the latter the relation between brake and drawbar horsepower. The review of test results shows that α averaged about 0.75 and β about 0.52 for gas tractors, about 0.73 for steam tractors, and about 0.64 for motor plows.

The practical value of model tests on the plow, R. BERNSTEIN (*Mitt. Verb. Landw. Masch. Prüfungsanst.*, 9 (1915), No. 1, pp. 9-24, figs. 3).—This is a mathematical and graphical discussion.

Trial of steam thrashers at Lyallpur, W. ROBERTS (*Agr. Jour. India*, 10 (1915), No. 3, pp. 285-287, pls. 2).—A comparison of the work of a 30-in. and a 48-in. thrasher in threshing wheat is said to indicate the marked superiority of the 48-in. machine.

Using the modern grain separator, G. F. CONNER (*Power Farming*, 25 (1916), No. 1, pp. 9, 40, 41, figs. 4).—This is a brief description of the mechanical details of the grain separator in its present stage of development.

Test of a separator for cold milk of a capacity of 220 liters per hour, A. NACHTWEH (*Mitt. Verb. Landw. Masch. Prüfungsanst.*, 9 (1915), No. 1, pp. 32-43, figs. 3).—A machine for the separation of cream from cold milk is described and diagrammatically illustrated, and tests are reported with milk at temperatures varying from 3 to 15° C. (37.4 to 59° F.).

The main difference between this machine and those for the separation of warm milk is that the cylinder is larger and the size and number of disks

and of inlet and outlet holes are greater. It was found that the separator removed from cold milk all but from 0.12 to 0.18 per cent of the fat and also cleaned the milk. Separation was continued for an hour without obstruction.

List of farm building plans (*Mississippi Agr. Col. Ext. Dept. [Circ.]*, 1916, pp. 11, fig. 1).—A list of farm building plans furnished by the agricultural engineering department of the Mississippi College to farmers of Mississippi is given.

Silos, D. SCOTTES (*Mississippi Agr. Col. Ext. Dept. Circ.*, pp. 7).—This circular discusses briefly the essential features of silos, especially the wooden and concrete types.

Refrigeration and its increasing importance for different purposes, W. AHRENS (*Naturwissenschaften*, 3 (1915), No. 87, pp. 477-483, figs. 9).—A discussion is given of the applicability and use of refrigeration for different purposes, together with a description of refrigerating processes and apparatus and their practical operation.

Ice on the farm, W. L. NELSON (*Missouri Bd. Agr. Mo. Bul.*, 13 (1915), No. 9, pp. 2-19, figs. 9).—This is a compilation of information regarding ice and farm ice houses, much of which has been drawn from Farmers' Bulletin 623 of this Department (E. S. R., 32, p. 591).

RURAL ECONOMICS.

The settlement of public lands in the United States, B. H. HUBBARD (*Internat. Inst. Agr. [Rome], Internat. Rev. Agr. Econ.*, 7 (1916), No. 1, pp. 97-117).—The author treats of the settlement of public lands in the United States beginning with the year 1783.

He states that "one sorry effect of the great liberality of the land policies by which settlement was encouraged, and almost never restrained, was the almost unbelievable rapidity of settlement of the western country. Population and grain production doubled throughout the great grain States in periods of about 20 years, and this at a time in the development when it meant the addition to the farm area of 50,000,000 or 60,000,000 acres of farm land and 6,000,000 or 8,000,000 of people per decade. The result was ruinously low prices and a discouraged and restless farm people. . . .

"At present what is needed is a plan by which the Government may administer the affairs of the land yet in its hands in such a manner as to result in putting it into the hands of people who will use it for production instead of exploitation. Likewise the state governments need land policies both with respect to land which they still possess and land which in private hands is being used with a view to speculative gains to the present owner, resulting in hardship to the man who actually undertakes to turn a portion of it into a farm."

The nature of demand for agricultural products and some important consequences, J. G. THOMPSON (*Jour. Polit. Econ.*, 24 (1916), No. 2, pp. 158-182).—The author has divided commodities into two classes—elastic and inelastic. He considers that the demand for a commodity is elastic when that commodity is of such a nature that the demand is sensitive to price change or to a change in the purchasing power of the prospective buyer. He has placed agricultural products in the inelastic class, and states that with reference to food supplies as a whole it is very evident that the demand is relatively inelastic.

"With reference to any particular article of food in the consumption of which there is no fixed custom or habit there may be a considerable measure of elasticity of demand because of the possibility of the substitution of one article of food for another. But the consumption of one article of food in place

of another can not materially increase or decrease the amount of food consumed as a whole. A larger demand for one article would mean simply a smaller demand for other articles. . . . With reference to the textile fibers and other agricultural raw materials for the manufacture of articles of dress, there is seen to be a considerable degree of elasticity of demand, due to the character of the demand for the finished products. . . .

"In recent years the inelastic character of the demand for the products now raised on the farm has afforded a bar to expansion in the production of those commodities proportional to the improvements introduced in agriculture, and the consequence of the introduction of these improvements—especially improved agricultural machinery—taken in connection with the indisposition of demand for agricultural products to expand beyond a certain limit, has been to transfer workers by the millions from the farm to the urban centers. The city has gathered to itself, not only manufacturers, but many other activities for the products of which demand is of the elastic sort. The city has thus become, as compared with the country, the center of expansion in industry and thus in population."

The marketing of farm products, L. D. H. WELD (*New York: The Macmillan Co., 1916, pp. XIV+483, figs. 2*).—The author's thesis is that marketing is a phase of production as defined by the professional economist. He defines production as the creation of utilities, that is, any process that makes a thing more useful, as by molding it into more desirable forms in the factory, by transporting it from one place where it is less needed to another place where it is more needed, or by storing it from one season of the year when it is less needed until another season when it is more needed. He has treated this subject from this point of view under the headings of marketing at country places, methods of sale, functions and organization of wholesale trade, sales by auction, cold storage as a factor in marketing, cost of marketing, transportation as a factor in marketing, prices of farm products, produce exchanges, price quotations, future trading, inspection and grading, city markets and direct marketing by parcel post, cooperative marketing, problems of retailing, and weaknesses, remedies, and governmental activities.

Car-lot distribution, J. S. CRUTCHFIELD (*Fruit and Prod. Marketer, 7 (1916, No. 6, pp. 1, 4, 5)*).—The author summarizes his conclusions as follows:

"Car-lot marketing and distribution are accomplished most satisfactorily when the distributing organization, be it composed of growers or middlemen, has the confidence of growers, buyers, retailers, and consumers, as well as bankers and railroads. To justify and retain this confidence and cooperation necessitates an honest and intelligent effort to consider and respect the rights and interest of each."

[Purchase and marketing associations in Posen and West Prussia, their systems of organization and development], Z. NIKLEWSKI (*Landw. Jahrb., 47 (1917), No. 5, pp. 719-787*).—The author points out the occasion and motive for the establishment of the association, the organization of the different unions, the amount of business transacted, and the extent of the organization and membership, and appends a brief bibliography.

Historical sketch of the development of the Central Bureau and Netherlands Agricultural Committee, C. G. J. A. VAN GENDEREN STORT (*Nederland. Landb. Com., No. 2 (1915), pp. 91-184*).—This article describes the first central bureau organized to purchase commercial fertilizers and its development and reorganization. The different laws relating to the Central Bureau and the Netherlands Agricultural Committee are included.

Report on the working of the cooperative credit societies in the district of Ajmer-Merwara, 1913-14 (*Rpt. Work. Coop. Credit Soc. Ajmer-Merwara*,

1913-14, pp. 18+31).—This report shows the number of societies, membership, working capital, interest, rate on loans and deposits, and profit and loss. A brief statement relative to the principal problems arising during the year is included.

Report on the working of the cooperative societies in the Central Provinces and Berar, 1914-15 (*Rpt. Work. Coop. Soc. Cent. Prov. and Berar, 1914-15, pp. 8+12+40*).—This report gives the number of societies by types, their membership, capital, rate of interest, receipts and disbursements, and profit and loss.

Report on the working of the cooperative societies in the Punjab, 1915 (*Rpt. Work. Coop. Soc. Punjab, 1915, pp. 3+3+11, tables 15*).—This report gives the number and types of societies, receipts and disbursements, profit and loss, rate of interest, and a brief review of the progress in the organization and supervision of cooperative societies.

How to finance the farmer: Private enterprise, not state aid, M. T. HERICK and R. INGALLS (*Cleveland: Ohio Com. Rural Credits and Coop., 1915, pp. 58*).—The authors discuss the rural credits movement, early methods of stimulating farm mortgages, building and loan associations, landschafts, bond and mortgage companies, and rural cooperative banking.

In calling attention to the difference between the landschafts and the building and loan associations they claim "that the building and loan association serves both investor and borrower members; it finances itself by their savings, avoids the use of its credit, makes its loans in cash, and is purely cooperative. The landschaft, on the other hand, serves only borrowers; it has no need of savings, deposits, or working funds coming from any source, from either members or non-members, since it operates entirely upon credit and makes its loans in debentures, while it is neither an association nor a company; nor is it cooperative, although it imposes mutual liability on members. In spite of these fundamental differences, however, there are points of resemblance; both are thrift institutions and both are protected by a safeguard which prevents them from being encumbered with obligations to outside parties. . . . Nobody joins the landschaft except applicants for loans, and membership ceases upon repayment of the loan; but liability as a member continues for a statutory period, usually two years, after retirement. . . .

"A marked similarity appears between the methods of accumulating the sinking fund in a landschaft and the capital of a building and loan association. Both come entirely from members through obligatory periodic payments made with the effect, if not in the spirit, of thrift; but there the similarity ends, for a landschaft is the creditor, while the building and loan association is the debtor, of members in respect to its funds, with the landschaft holding exactly a converse position in respect to the outside world."

It is also claimed that the agricultural States should be divided into districts for issuing debentures for loans secured by massed mortgages on farm lands and guaranteed by the unlimited, collective liability of the borrowers.

The following legislative steps are considered necessary for the proper organization of rural credit: "An amendment of the National Banking Act so as to permit a national bank that confines its credit facilities to members to be organized as an association of any form without capital stock; An amendment of the banking act of each State so as to permit any kind of bank that confines its credit facilities to members to be organized as an association of any form without capital stock; an enabling and regulatory law by the nation and by each State, legalizing for economic associations whatever is lawful for corporations; a clause in such laws to permit combination among farmers' associations and associational banks, among associations organized for selling

food and household supplies to members, and among associations organized by artisans for buying on their common account the materials needed in their work or for selling their products."

Rural organization, community, county, division, state, H. A. MORGAN and H. K. BRYSON (*Col. Agr. Univ. Tenn., Ext. Div. Pub. 10 (1915)*, pp. 19, pl. 1, fig. 1).—The authors believe that there should be organized in the local communities, clubs whose membership have a common interest, and that the local organizations should be federated into county, district, and state institutions. Methods of procedure in the organizing of clubs and a model constitution and by-laws are given.

Country life week, 1915 (*Ohio State Univ. Bul.*, 20 (1915), No. 6, pp. 70, figs. 22).—This report contains abstracts of addresses presented at the second country life conference (E. S. R., 33, p. 190), held at the Ohio State University, August 2-6, 1915, including the following: Rural Organization in Ohio, by P. L. Vögt; Church Administration and the Rural Problem, by W. F. Anderson; The Psychology of Religion, by J. H. Snowden; Rural Resources for Church Efficiency, by G. W. Fiske; Progress in a Northwest Ohio Community, by W. E. Grove; Some Country Church Problems in Ohio, by C. M. McConnell; The Place of the Rural Y. M. C. A. Work in Ohio, by T. D. Lanham; Annual Report of the Executive Secretary of the Ohio Rural Life Association, by C. O. Gill; The Grange as a Community Builder, by L. J. Taber; Agricultural Extension, by C. S. Wheeler; The Farm Bureau of County Agent Work, by G. W. Bush; and Causes of Feeble-Mindedness and Treatment of the Feeble-Minded, by E. J. Emerick.

Rural housing, W. G. SAVAGE (*London: T. Fisher Unwin, 1915*, pp. X+11-297, pls. 16, figs. 5).—The author gives briefly the historical development of the housing problem in England and Wales and describes how the housing conditions may be improved. A brief review of the laws relating to rural housing and sanitation is included.

He summarizes his conception of the housing problem as follows:

"Existing cottages are wearing or have worn out; economic causes prevent private enterprise erecting more in anything like sufficient and compensatory numbers; the local authorities will not build if loss is likely to fall upon the rates and the powers to make them are ineffective; the State, through the Local Government Board, exhorts and stimulates, but provides no pecuniary help; the problem is being solved in each place in which it arises by the migration to town or colony of some of the best of the agricultural working classes.

"If the shortage of houses is dealt with, the question of dealing with defective houses presents no great administrative difficulty. The remedy for defective houses is simple—it is more houses. If only there are enough houses the defective houses can be closed or made fit."

Periodic migrations of Irish agricultural laborers, J. HOOPER (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel.*, 6 (1915), No. 12, pp. 105-114).—The author points out the source of the migratory laborers, their extent, types, character of work performed, wages, and savings.

Suggestions concerning checking and tabulating farm management survey data (*U. S. Dept. Agr., Office Soc. Farm Manage. Circ. 1 (1916)*, pp. 40).—Assuming that the investigator is familiar with the methods of gathering farm management survey data in the field, this pamphlet is intended as a desk manual to aid in using these data. The subject is treated from the following standpoints: Checking the office sheets, preliminary calculations, principles of tabulation, classification of farms by tenure, and suggested tables. There is a brief discussion under each of these headings, together with a number of illustrative examples.

Lumber accounting and opening the books in primary grain elevators, J. R. HUMPHREY and W. H. KERR (*U. S. Dept. Agr., Office Markets and Rural Organ. Doc. 2 (1916)*, pp. 12).—This pamphlet describes the forms necessary to supplement the regular grain elevator accounts when the elevator carries on a lumber business as a side issue, and methods of opening and closing the books of grain elevators. Model forms for the lumber accounts are included.

Some extremes in Ohio soils, C. E. THORNE (*Mo. Bul. Ohio Sta., 1 (1916)*, No. 3, pp. 77-85, figs. 2; *Agr. Student*, 22 (1916), No. 5, pp. 313-320).—In this article are given comparative results obtained on the experimental farms in Clermont and Paulding counties by the use of different combinations of fertilizers and crops. Marked differences were observed, and it is concluded that "it would seem, as a business proposition, the Paulding county farm was a better investment at \$175 per acre than the Clermont county farm at \$50."

Statistics of Ohio farms, F. M. LUTTS (*Mo. Bul. Ohio Sta., 1 (1916)*, No. 3, pp. 91-95).—The author has pointed out some of the errors found in the agricultural statistics gathered by the township assessors. The principal difficulties were due to misinterpretation of the questions and carelessness in taking the original record, as well as in tabulation.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt.*, 2 (1916), No. 2, pp. 13-20).—This report gives a summary of farm prices for corresponding months of 1914, 1915, and 1916, the estimated value of important farm products on January 15 and February 1, 1916, with comparisons for earlier years, the range of prices of agricultural products at important markets, a preliminary estimate of the acreage of truck crops in Florida, a revised estimate of the acreage contracted for by canneries of corn, peas, and tomatoes for 1913, 1914, and 1915, brief statements regarding ocean freight rates on wheat, the crops of India for 1915-16, the Census report on beet sugar for 1914, and miscellaneous data. The aggregate crop value for the thirteen principal crops for 1915 is estimated at \$5,345,842,000 and for all crops \$6,788,905,000.

A summary statement is made relative to the diversification of crops in the South. The wheat acreage in the Southern States increased from 3.7 per cent of the total acreage in 1911 to 7.9 per cent in 1915, the oat crop from 43 to 7.1, and the hay crop from 3 to 3.6 per cent.

There is also included a special article by S. A. Jones relative to beans and peas. This contains statistical tables showing the uses to which the crop is put, the usual dates of planting and harvesting, and the acreage of the individual kinds compared with the total acreage of all beans and peas in the various States.

Agricultural statistics of Italy (*Ann. Statis. Ital.*, 2. ser., 4 (1914), pp. 155-168).—This report continues data previously noted (E. S. R., 32, p. 491), adding information for 1914.

AGRICULTURAL EDUCATION.

The fighting chance for agriculture, E. B. COLLETT (*Proc. Cent. Assoc. Sci. and Math. Teachers*, 14 (1914), pp. 25-28).—The author endeavors to point out some dangers to agricultural instruction in its effort to gain a place in the educational system. He concludes that while agriculture brings most valuable and practical material to the school, it lacks an organization and richness of content necessary for class-room work; that, in order to render a real service to the educational system, there must be poured into the heart of the course a technique, such as Latin contains, for mental development; that a careful watch must be kept of scientific advancement and at the same time its particular application to the changing needs of agriculture in practice; and that not the course of study but service toward mankind must be made the goal.

"Agriculture, as a school course, had better never be taught if it fosters an aim of specialized competition among men rather than a united effort in directing the forces of nature for the benefit of mankind."

Vocational training and liberal culture, C. C. SCHMITT (*Proc. N. Dak. Ed. Assoc.*, 28 (1914), pp. 180-187).—The author gives the definitions of the term "culture" of a number of leading educational authorities and discusses the cultural value of vocational education, taking agricultural and home economics courses as examples.

Work for the improvement of rural education, C. P. COLEGROVE ET AL. (*Bul. Iowa State Teachers Col.*, 15 (1915), No. 3, pp. 83, figs. 116).—This is a report on the work of the Iowa State Teachers College in the improvement of rural education by means of rural demonstration schools; the introduction of agriculture, domestic science, and manual training, which are required subjects in the rural schools of Iowa since July 1, 1915; the organization of community centers; extension work for the improvement of teachers in service, including teacher study centers, county institutes, lectures, and entertainments; and training teachers for rural schools.

Recommendations and regulations for the establishment, organization, and management of agricultural and household science departments in continuation and high schools and collegiate institutes (*Toronto, Canada: Ont. Dep't. Ed.*, 1915, pp. 45).—The requirements as to accommodations, equipment, qualifications of staffs, and courses of study for the approval of the establishment of an agricultural or household science department, or both, and the distribution of the annual government grant of \$150 for each year of the courses in agriculture and household science, respectively, under the industrial education act, are outlined.

It is provided that the school board must appoint an advisory agricultural committee, consisting of four members of the board and four rate payers actually engaged in agricultural pursuits, and that for a beginning an area for experimental plots of 8 or 10 square rods of land within the school grounds or adjoining them may be found sufficient. The courses at present cover only two years but a third year will be added as soon as required. The agricultural subjects include farm mechanics, science, fruit growing, floriculture, landscape and vegetable gardening, beekeeping, poultry husbandry, field crops, animal husbandry, dairying, farm management, rural economics and arithmetic; and the household science subjects include cleaning, cookery, foods, the house, laundering, sewing, marketing, entertaining, household accounts, home nursing, and emergencies, beekeeping, poultry and dairy husbandry, fruit growing, floriculture, landscape and vegetable gardening, entomology, bacteriology, and rural economics. Lists of suggested home projects in agriculture and household science are included. An outline of a seasonal course in the special agricultural subjects and price lists of equipment for the agricultural and household science departments are appended.

The best type of agricultural high school, C. J. N. NELSON (*Proc. N. Dak. Ed. Assoc.*, 28 (1914), pp. 81-84).—This discussion is intended to bring out the relative economy and efficiency of the two types of agricultural high schools in the State of North Dakota, viz., the state schools and the county or Gilbens schools.

The state agricultural high school is a city school receiving \$2,500 annual state aid for agricultural instruction, the agricultural department of which is under local direction and supervision. The county agricultural school is a separate institution with a separate building, faculty, and administration, under the direction of a county board, and receiving \$3,000 annually from the State for maintenance.

The author believes that a maximum of efficiency at a minimum of expense can best be attained when agriculture is put in as a department in a school rather than to make the school exclusive in this line and limiting the work only to prospective farmers. He contends that agriculture should be placed within the reach of all young people, boys or girls, side by side with all other cultural subjects and not segregated from the so-called cultural school. Further, the student in the high school should not begin to specialize except to some extent in agriculture in the higher classes, and should be in a school with broad courses and liberal electives to have full freedom of choice.

The Gibbens schools, W. A. BROYLES (*Proc. N. Dak. Ed. Assoc.*, 28 (1914), pp. 77-80).—An account is given of the organization and work of the county agricultural school at Park River, N. Dak., which is one of two such county schools supported jointly by the county and the State under the Gibbens Act of 1911, amended in 1913 (see above).

These schools are free to residents of the county, and teach agriculture, including the study of soils, horticulture, plant life, and animal life, a system of farm accounts, mammal training and domestic economy, and the common branches and such other branches as are necessary for the training of teachers in methods of school management and provision for observation and practice in the art of teaching. The schools are a continuation of an ungraded system instead of a graded system and the law does not define or speak of them as high schools.

The advantages of this type of school are summed up as follows: "The county as a unit has more funds than a smaller unit and admits of more systematic extension work than a larger unit. . . . In attacking the question of rural community life in its various phases the county school has the great advantage of a single aim. . . . It has no set of grades to divide the time of the executive. In its rural school work it has the resources of the county superintendent's office with its deputies to share responsibilities and give assistance. It has no assured consistency in the form of a ninth grade coming in regularly with the change of the seasons. This single-mindedness gives it opportunity to concentrate its forces upon certain things—individual instruction and careful classification; an elaborately planned and directed short course, going about the county, learning of it and serving it through schools and families, providing a center for rural life propaganda."

Eighth annual report of the inspector of high schools to the state board of education for the year ending June 30, 1915, R. HEYWARD (*Bismarck, N. Dak.: State Ed. Dept.*, 1915, pp. 53, figs. 9).—This report includes, among other material, statistical data on the enrollment, equipment, salaries, etc., of the five state high schools having an agricultural department, and brief reports on the school farm at Carrington, the extension work of the schools, and state aid for agricultural instruction.

It is shown that 43 high schools offered courses in agriculture in the past year and that 8.5 per cent of the pupils enrolled pursued the work. The five schools having an agricultural department report a total value of equipment for agricultural instruction of \$2,850, and a total enrollment in agriculture of 133, a gain of 24 over the previous year. The enrollment in agriculture in all of the other state high schools for the year was 307, a gain of 65 over the previous year. Each of the five schools received \$2,020 state aid for its agricultural department.

What the instruction at the Royal Agricultural, Horticultural, and Forestry High School is and what it should be, Z. KAMERLING (*Indische Mervuur*, 38 (1915), Nos. 28, pp. 565-567; 29, pp. 585-587).—This is a discussion of the curriculum of the Royal Agricultural, Horticultural, and Forestry High

School at Wageningen, The Netherlands, and suggestions for its improvement, by an instructor who was a former student at this school.

Material and methods for teaching agriculture in the grades below the high school, C. D. LEWIS (*Proc. Ky. Ed. Assoc.*, 44 (1915), pp. 158-160).—The author does not consider agricultural instruction so much a new branch to be taught in the elementary schools as a new attitude of mind, a new relation to life, which it is hoped to secure through new ideals and ideas gradually instilled into the lives of children through the medium of the old subjects reorganized around a new center. He discusses the reconstruction of the elementary general school subjects to this end, and recommends that agricultural nature study material be added and that the science of agriculture be left for secondary and higher institutions.

Home projects in secondary courses in agriculture, H. P. BARROWS (*U. S. Dept. Agr. Bul.* 346 (1916), pp. 20).—With the view of making the home farm a more definite factor in agricultural instruction through the home project plan, the author discusses the development of the home project idea and the essentials of a successful project; outlines potato, pig, alfalfa, orchard, poultry, and farm home projects; suggests lists of production, demonstration, improvement, and management projects; and calls attention to some project problems now receiving attention.

Physical geography and soils, R. P. GREEN (*Proc. Ky. Ed. Assoc.*, 44 (1915), pp. 160, 162-167).—This is a consideration of the problem of so teaching physical geography as to increase the pupils' knowledge of the soils, especially as to their origin and nature, the destructive work of mechanical erosion and its relation to soil fertility and permanent agriculture, etc.

Home economics instruction, COUNTESS R. DE DIESBACH (*Enseignement ménager. Paris: Pierre Tiquet* [1914], pp. XXXII+127).—This is a discussion of the need, nature, organization, choice of teacher and her qualifications, and results of home economics instruction in France.

Extension course in vegetable foods, ANNA BARROWS (*U. S. Dept. Agr. Bul.* 123 (1916), pp. 78, figs. 4).—This is a revision of Bulletin 245 of the Office of Experiment Stations, previously noted (E. S. R., 26, p. 597).

Teaching of sewing, RUBY BUCKMAN (*Proc. Ky. Ed. Assoc.*, 44 (1915), pp. 96-98).—The author offers suggestions on subject matter and method in teaching sewing, and holds that sewing if properly taught possesses cultural value and numerous other advantages.

Nature-study in the Genesee schools, Ill., JOSEPHINE BAILEY (*Nature-Study Rev.*, 11 (1915), No. 9, pp. 418-421).—The study of insects, animals, birds and flowers, and weeds and trees in grades 3, 4, and 5 of the Genesee, Ill., schools is described.

Intensive gardening, ELIZABETH P. SHEPPARD (*Nature-Study Rev.*, 11 (1915) No. 9, pp. 424-428, fig. 1).—An outline is given of gardening work as conducted in the spring of 1915 at the normal school at Trenton, N. J. Some 200 children of the practice school worked out garden projects, individually or in groups, and about 100 normal school students from the nature study classes assisted in the activities, learning how to plan and conduct this part of nature study.

Boys' and girls' club work for 1916, C. A. NORCROSS (*Agr. Ext., Univ. Nev. Leaflet 1* (1915), pp. 4).—This circular outlines the organization and procedure for three state-wide boys' and girls' clubs organized in January, 1916, viz., a girls' home economics club and boys' and girls' animal husbandry and gardening clubs. It is proposed to offer 2-year courses in these clubs, those having received an extension certificate for the satisfactory completion of the first-year course being eligible for the second-year advanced work in 1917.

NOTES.

Georgia Station.—B. W. Hunt, of Eatonton, has been appointed to succeed J. W. McWhorter as a member of the board of directors.

Kansas College and Station.—D. E. Lewis, assistant professor of horticulture and assistant in the fruit and vegetable disease investigations, resigned April 1 to engage in commercial fruit growing. P. E. Crabtree, specialist in crops in the extension division, has been appointed district agricultural agent for western Kansas with headquarters at Scott City.

Maine University.—Alexander Lurie, instructor in horticulture, has been appointed horticulturist in the Missouri Botanical Garden.

Cornell University.—The New York State College of Agriculture, in cooperation with various other state agencies, such as the farm bureaus, is conducting an active campaign this spring against oat smut. In this campaign it is using a pictorial poster in bright colors, the poster showing two men in the act of treating smut with formaldehyde solution, while the lettering on the poster gives very briefly the essential features of the treatment. Information on the subject is being sent out systematically to the agricultural press, largely through the farm bureau agents. One of the railroads of the state is running an oat smut demonstration train.

All of these activities are regarded as preliminary to the most important part of the work, which is actual demonstration through meetings with farmers.

Pennsylvania Station.—The station has planned an extensive field test of different carriers of phosphorus. The plan of this experiment calls for 4 tiers of 41 one-tenth acre plats in each, making a total of 164 plats. The crop rotation will consist of corn, oats, wheat, and mixed clover and timothy, each one year, and the fertilizers will not be applied until the plats have passed through one four-year rotation. This will afford preliminary data concerning the relative fertility of the plats.

The experiment is designed to test the relative efficiency of equal amounts of phosphorus in different carriers when used in connection with a complete fertilizer, with barnyard manure, and with a crop rotation in which the crop residues are returned to the soil. It will also include the effect of lime on the different forms of phosphorus, together with a comparison of the different methods of applying rock phosphate and acid phosphate.

During the past summer preliminary field and pot experiments were conducted with soil of the Dekalb series from the vicinity of Snow Shoe, Center County. This has led to the establishment of a field experiment in somewhat greater detail with a view of determining the effect of manure, lime, and commercial fertilizers for the improvement of the Dakalb soils.

Rhode Island Station.—Frank O. Flits has resigned as assistant in chemistry to accept a similar position at the New Jersey stations.

Vermont University.—County agents are now at work in 11 of the 14 counties of the State. F. C. Shaw, agricultural instructor in the farm and trades' school at Thompson's Island in Boston Harbor, began work in Bennington County March 27, and F. H. Abbott in Washington County, April 13.

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